ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol. 1 No. 2

October 1987

Why I Oppose Nuclear Power

Talking to scientists and engineers al Kakrapar and Tarapur, I have often had the feeling that we were either talking two different languages or were engaged in a dialogue of the mutually deaf. Inspite of my great admirations for their sincerity and enthusiasm, their efforts to convince me of the desirability of having nuclear power plants in the country have, I must confess, fallen far short of target. Their arguments have not satisfied me, for zeal alone does not persuade and sincerity alone cannot carry conviction.

First of all, I would like to see a position that ought to be common between participants of any dialogue — the position of being seekers of truth. I try to keep my mind open to the best of my ability and appreciate a reciprocal openminded response from the other side.

They talk about progress, development and advancement. Who does not commend these values? But there seem to be two entirely different concepts of these words. Top most nucleocrats have often said that the progress of a people can be measured by the quantum of electricity used by them. Can consumption of electricity really be the measure of progress? As a matter of fact, can the consumption of anything ever be the measure of development ? There is a question of values here. Where does the advancement of the individual and the society lie, in consumerism or in sharing? History is replete with cases of decline in civilisation when people have made increasing wants their ideals and goals. What I would like to emphasize is that increasing wants and progress are not synonymous. Progress of a civilisation to me is based on inner joy rather than on outer accumulation. The joy among individuals and communities depends more on mutual cooperation, willingness to share each others sorrows and happiness, fortunes and misfor-tunes, rather than on a self centered attitude with each person bent upon competing with the other in a race to accumulate wealth. Progress of a society is based on a healthy balance between change and stability resulting in a steady journey towards higher goals, rather than on ever increasing activity to counteract (real or make-believe) threats to internal security. Progress lies in good neighbourliness which creates a sound basis for mutual security and commercial and cultural exchanges rather than on increasing suspicion and lack of trust in neighbours leading to an arms race. Pro-gress lies in peace, rather than in war. Progress of mankind depends on a science of life, a science which respects, enhances and cherishes life, rather than on a science for death, a science that plans and executes destruction of human beings and environment.

Next comes the question of priorities. For whom are we making these enormous efforts? In our society the distribution of the dividends of these efforts is appalingly unjust. The immediate risks of nuclear activity are faced by the poor adivasees living in the vicinity of Kakrapar (or at other spots where the nuclear facilities are located) but the benefits of the electricity produced by them are enjoyed by a small minority of bulk consuming industrialists. To help those who have, by putting at risk those who haven't goes against the very foundations of justice. A society which cherishes egalitarian ideals, should begin its development by seeking the good of the lowliest and the lost, rather than begin at the top in the hope of benefits trickl-ing down.

The concern about pollution of the environment is often sought to be met by the argument that coal and other chemical industries create equal if not more pollution. I hold no brief for these other polluting agents. But the existance of other agents does not reduce the undesirability of radio-active pollutants, especially when we consider their millenia lasting effects.

My ecological concerns are rooted in my con-cept of man's relationship with nature. There is a concept which considers man as the conqueror of nature. I believe that this idea leads to exploitation and ultimately depletion of natural resources. I perceive man as an integral part of nature, who must endeavour to live in harmony with it. Split-ting of the atom has broken the harmony of nature. The bomb destroyed two cities and threatens to destroy the rest of mankind. The power plants have the potential to pollute the whole planet.

Science of death is secretive. 1 am concerned about the atmosphere of secrecy maintained around nuclear activities. It is strange, that in a free demo* cracy like ours, the Department of Atomic Engery, is not responaible even to the Parliament. The phenomenon *of* 'classified information' is a violation of a citizen's fundamental right to know. If we are prepared to invite experts from across the borders to visit our nuclear plants, why are some of the reports about nuclear plants concealed from our own public?

The efforts to prove that nuclear generated electricity is cheaper than other sources is far from convincing, because the social costs involved in the production are hardly ever counted, the costs of waste disposal seldom reckoned and those of decom-missioning of the plants after a short lifespan of 25 to 35 years are yet to be calculated.

I am not convinced that nuclear power is either cheap, clean or safe. Each one of these claims can and has been challenged. But more than that I am not convinced that the monsterous effort put in to produce this energy is in the right direction. The direction is totally misleading. To me it seems to be leading the poor towards starvation; the less informed towards absolute ignorance; the weak towards complete istrablity: the already not-so-clean world towards difty irremedial pollution; the vulnerable planet towards its doom.

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Bombay Peace March

About 1500 enthusiastic college boys and girls along with Sarvodaya and other peace workers took out a peace march from the Gandhi Museum (Mani) Bhavan) to Chuchgate in Bombay on August 6th. The marchehs carried placards, 20 feet long bannerss and wore peace badges, T-shirts and aprons inscribed with anti nuclear slongans. The march ended with a demostration followed by a street play outside Churchgate station. An exibition of about 100 posters on 'Nuclear Disarmament and Peace' was inaugerated at the Government Law College. An anti-nuclear book, the first of its kind in Marathi was also released on the occasion. Entitled 'Nuclear Power : Curse not Boon', it is written by Shri Gangaprasad Agarwal, a veteran Sarvodaya worker from Marathwada. The march received extensive coverage in the Bombay print media.

Bombay Sarvodaya Mandai plans to continue its programme of educating the people on nuclear issues. It recently organized a poster exhibition and a lecture at the Elphinston College. Similar activities are planned for other colleges in the coming days.

Sociology of Nuclear Disaster Reporting

The Issues raised in two articles which were published by *Media Monitor* (Nov| Dec 1986) are critically important particularly for India and oilier Third World societies where science reporting is still in its infancy. There are no specially trained journalists, nor training centres, for science report-ing. Only recently, a few newspapers have started periodic science supplements, which primarily aim at popularisation of science, as against critical re-porting on high science and nuclear activities and man-made nuclear disasters. For example, to my knowledge, no science supplement has so far carried a story on TMI, Chernobyl and Challenger dis-asters or on radiation hazards from the Chernobyl fallout

Let us recall how the Chernobyl disaster was reported in India. The explosion took place in the early hours of April 26, 1986, and it was detected over Sweden by the next morning. By the 28th ail western media were buzzing with Chernobyl news, comments and criticism, assessments and mostly guesswork as to what might have occurred inside the USSR. On the morning of the 29th first news of Chernobyl reached India over the BBC but no newspaper carried any report that morning. Bet-ween the two official media, TV (Doordarshan) placed embargo on the news while AIR managed a brief mention in its late night broadcast. Only on the morning of the 30th—full four days after the accident—our national dailies reported the dis-aster mainly quoting Reuter, PTI and A.P. TV finally reported the accident in its regular night news bulletin almost six days after, and still without any comments from any Indian or foreign scientists. On May 1, *The Statesman* carried a special report from its Paris correspondent and based on European sources indicating the severity and possible threat to population and environment posed by the accident. It also indicated that full details were still awaited to make an assessment of the distaser. But TOI, in contrast, while reporting the accident on April 30th, came but with a hurriedly written editorial, "A Major Mishap", in which a rather poor attempt was made to pre-empt criticism of nuclear power and cushion the impact of the worst disaster. Describing it merely as a "mishap", without any scientific basis, the editorial attempted to defend a basically indefensible position by claiming that "the kind of pressure that seems to have caused damage to the reactor at Chernobyl is not created in Indian reactors". Upto that time we did not even know the type of reactor system involved in the Chernobyl accident. Apparently, the inside information came from the Department of Atomic Engergy. which was troubled lest public papic should also turn against the nuclear power program-me in India.

Indian Express, in contrast, carried long reports on the 30th morning based on western news agencies but its science correspondent (Somnath Sapru) gathered technical details of the reactor and raised a pertinent question whether the radiation fallout could reach the Indian sub-continent. IE was the sole exception in this regard and it invited my critical comments. Later, I learnt that no Indian scientist was willing to make comments to the press. It was in direct contrast with the western scene where, as David Rubin has reported in MM, the media had collected techno-scientific details, in cluding probable ill effects of radiation fallout from 300 scientists of various institutions within the first few hours.

Indian media in the following days, weeks and months showed little interest in the outcome of the accident. The only exception was when *The Obser-ver* (London) team released their best-seller. *"The worst accident in the world Chernobyl: The end of the nuclear dream"*. Almost all national dailies and several weeklies published excerpts from the book and highlighted the seriousness of the accident But there was still no critical reporting, gathered from independent sources, nor was there any deeper, attempt to bring details of the disaster to Indian readers. Of course, the official media(TV)made special programmes to boost the damaged prestige of nuclear energy in this country. It was repeatedly asserted that our country's nuclear safety records were the best in the world and that there is no possibility of a Chernobyl in India. While many publications gave no credence to the official claims, TOI, and *The Hindu* remained fervently pronuciear to the extent that they opposed any weakening of the nu-clear energy programme. *The Hindu* even editori-ally ridiculed those who opposed nuclear power on environmental grounds. IE under the editorship of George Verghese was exceptionally critical of nuclear energy and maintained a critical posture vis-a-vis nuclear technology.

From a journalist's perspective a nuclear power plant accident is not like a natural disaster—hurri-cane, floods or earthquakes where, as David Rubin described, "disaster information specialists" arc ready to assist him with information. But there are not many precedents of a nuclear disaster, there is no-one to brief you on the spot and there is little scope for a courageous reporter to rush to the site of nuclear accident and give an eye-witness account of the scene. All nuclear accidents immediately make the site inaccessible, if it was not already so. In order to avoid public panic, strict secrecy is maintained by the authorities, and the media are totally dependent on official sources for comments and details. A reporter's own knowledge and understanding of nuclear problems is. therefore, critically important in providing the public with a comprehensive picture of the disaster. Only journalists with such understanding and know-ledge and good resources at their disposal, good contacts with official and independent scientists, can effectively report on a nuclear disaster.

Nuclear power has come up as a commercial and industrial activity not due to peaceful scientific research but as a direct outcome of war-oreinted research activities. Thus it is conducted under total secrecy and only with government funding and patronage. And since governments have vested interest in promoting nuclear programme all official efforts for the last 40 years have been directed to projecting pro-nuclear arguments. This over selling of nuclear energy has made our journalists conditioned to pro-nuclear perspectives. Nuclear power has been propagated as the ultimate in energy sources. Because it has been equated with national progress and technological advancement, without reflecting on the possible consequences for future generations, our media have shown a general consensus that does not want to upset the country's nuclear boat.

Vilanilam, while comparing NYT and TOI reporting on the Three Mile Island accident, explain-ed one possible reason for the newspaper's benign attitude towards nuclear power as "national pride and support to one's government". Admittedly such is the case as was vividly demonstrated by the cold war rhetoric of the US media during early report-ing on Chernobyl. Nuclear reporting is very much linked with foreign (and defence) policy perspec-tives of the media. This chauvinism has been a determining factor on nuclear accident reporting, or non-reporting, in this country.

The same reason governs the behaviour of our political parties and parliamentarians which do not insist on discussion of budgetary details of critical ministries—Atomic Energy, Spare and Defence. There are hardly any critical books written by Indian scientists and / or social scientists, economists, or even environmentalists of this country on social ramifications of nuclear energy, and space research, as these are inherently linked with the country's defence aspirations. Indian journalists are integral to our social ethos and scientific detachment from one's national bias is too tall a parameter for the Indian media.

TMI and Chernobyl accidents have raised the fundamental question of reassessment of nuclear fission technology as a reliable source of energy for the 21st century. But judging from TOI and *The Hindu* coverage of these accidents and contrast-ing them with reporting in *The Guardian, The Observer,* and *New Scientist* (Weekly) of England and *Indian Express, Sunday Mail, Sunday Observer,* and *Illustrated Weekly* (under the present editor ship of Pritish Nandy), it appears that the pro-or anti-nuclear stance is shaped by attitudes in respect of the Establishment in general. 'Political realism' determines the depth and direction of reporting on a nuclear crisis, even if it glosses over scientific facts. Anthony Tucker, a noted journalist and science editor of *The Guardian,* and several writers in *New Scientist* have published substantial data indicating that nuclear power after Chernobyl has become a 'phasing out' proposition. Indian publi-cations, in this critical group, also appear to have maintained a pro-environmental position and have reported strong public concern against nuclear radiation Hazards.

Sometime, after the TMI accident in 1979, *Illustrated Weekly* carried an extremely pro-nuclear article. When I approached the *Weekly* for a critical view to be given equal space, the then editor replied that so long as he was in that chair no anti-nnclear view would be published in the *Weekly*. And then he confided, "I have to live in Bombay (the headquarters of the department of Atomic Energy)". There is another, more serious and committed, attitude which also inhibits objective reporting of nuclear accidents. *The Hindu* sincerely believes that nuclear energy offers a powerful means for our national advancement and, therefore, any adverse reporting would harm the national cause. Its proprietor-editor told the writer that he has placed his unquestioned faith in the knowledge and authority of India's nuclear scientists.

All nuclear accidents are caused by human error (technical failure has not yet been established). While in a natural disaster, no-one is humanly responsible, in case of nuclear disaster, fixing the responsibility of blame or error is critically im-portant. The journalist's task is, therefore, very sensitive, as it brings him | her in direct conflict of interest with those who are the sources of informa-tion, and in all probability themselves are the epicentre of the disaster. In India, thereforce, there has never been a public enquiry into a nuclear accident, and there has never been a case in which responsibility has been fixed for radiation leaks. The gap between the official source of information and the journalist's investigation is too wide for any relible reporting on nuclear accidents in this country.

Besides, as stated above, there are no independent scientific sources (non-government) or public interest organisations which can help the media persons. There are also few vocal, non-official scientists in our country. Many members of Parlia-ment have told this writer that government must listen to the scientists who are qualifiled and paid by the exchequor to advise on the complexities of nuclear policy. But nuclear reporting requires easy access to critical data (official briefing is not sufficient) which, in the prevailing secrecy and non-accountability of our nuclear sub-government, is not possible. A poor Indian or Third World journalist unprovided and unprotected (against the official wrath), cannot prepare an authentic story on nuclear disaster.

In reporting a nuclear accident the most crucial point is then to respect the responsibility of news-media to the public interest, particularly in a closed information system. The Chernobyl nuclear disaster is not the first, nor is it the last, but the worst atomic accident of our times. Indian news-media must be prepared for any future eventuality, especially since government has launched an ambitious programme of producing 10,000 MWe nuclear power from inherently unstable breeder reactors. It is suggested that special training programmes may be worked out for our science writers and reporters in order to update them with necessary information, critical data, and details on earlier accidents and on safety measures and man-agement of atomic crisis systems. Our media must also be familiar with civil defence administration, available to the public in India, in the event of an atomic disaster like TMI and Chernobyl.

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Courtsey : Media Monitor March/April, '87

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Irritation Over Irradiation

An *"important* milestone in food preservation methodology since the successful development of canning in the 19th century" — this is how the Department of Atomic Energy (DAE) in its PR magazine *Nuclear India* characterises the zapping of food with radiation. The process, which prolongs the shelf-life of fresh food, is called irradiation.

Irradiation seems to be the fashion worldwide. Thus, a Malaysian seminar recently announced that frozen shrimp exported to Japan would soon be treated by this "modern" process. Its pro-ponents are Malaysia's Nuclear Energy Unit, which has a vested interest in this, and Canada, one of the largest producers of Cobalt-60 in the world.

In Japan, the government has announced that irradiated oranges and fish paste products would soon be allowed into the country, in the interest of reducing trade frictions with the United States.

Increasing alarm

But there is also increasing alarm about both the safety of the process and the motives of those who" are pushing it. Mainly because of health hazards, the European Parliament has refrained from authorizing irradiation in general and has banned the import of irradiated food from countries other than the members of the European Community While the process is still under discussion in the United Kingdom, in West Germany selling of irra-diated food on the internal market has been banned For the export of food no such law exists.

In India, which recently cleared the applica-tion of radiation for preservation of onions, potatoes, frozen sea foods and spices, critical voices are raised. Kalpana Sharma writes. "The wisdom and appropriateness of the Government's decision allowing irradiation of certain food products for export and for the domestic market can he seriously questioned."

Food irradiation

The technology for irradiation has been available for more than twenty years. However, it has been applied for conserving food only recently. Beside applying accelerated electrons or X-rays, cobalt-60 or ceasuim-137 can be used in loading a device which produces beams of ionising radiation. Cobalt-60 and ceasium-137 are waste products of nuclear industry.

In relatively low doses of less than 15 kilorads the radiation prevents potatoes and onions from sprouting. Doses up to 50 kilorads delay the ripening of fruits like mangoes or bananas and extend their shelf-life by one or two weeks. It kills insects, bacteria and some fungi and thus disinfects and conserves fruits and vegetables without chang-ing their outer appearance. Higher doses around 200 kilorads "can extend the acceptability, and, in turn, marketability of iced fish by about two weeks". (*Nuclear India)* Spices may be exposed to kill insects and microbes.

It has to be noted that the dosage is not high enough to make irradiated food radioactive. However, the international debate on the health hazards of this process shows that research into this question did not yield uncontradicted conclu-sions so far.

Debate on health hazards :

The joint Expert Committee on Food Irradia-tion, which was set up by the Food and Agricul-ture Organisation, the World Health Organisation and, significantly, the International Atomic Energy Authority, declared irradiated food as safe, if it had been exposed to a dosage below 1 Mrad. This decision was made "on the basis of extensive wholesome new studies with laboratory animals carried out in different countries" claims the DAE. However, the Japanese scientist Dr. Kosei Takahashi found that the joint committee had ignored data which contradicted their findings, including Japanese and Soviet studies which showed mutations and organ changes in mice fed with irradiated diets.

In the US the Food and Drugs Administration has limited the permissible dose of radiation to a maximum which is smaller than the international!) recommended value by the factor of ten. The contradiction in what has to be regarded as a safe dose must make us suspicious of the validity of the research carried out in both cases.

The supporters of irradiation in the US rely heavily for their safety arguments on a series of 17 studies done by the Industrial Biotest Laboratories for the US Army, which "proved" irradiation to be safe. An investigation by the US General Accounting Office has since revealed deficiencies in their methods and in 1983 three executives of this institution were convicted of falsifying test data material relating to other drugs and chemicals. Such is the reliability of research carried out by institutions which are close to agencies having a vested interest in certain findings.

Research on health hazards has not been carried out on just laboratory animals. C. Bhaskaran and G. Sadasiwam from the National Institute of Nutrition in Hyderabad experimented on malnourished children which were fed with wheat which was unirradiated, freshly irradiated and wheat stored for twelve weeks after being exposed to radiation. They observed that the children fed with irradiated wheat produced abormal cells with more than the usual number of chromosomes. While this study, which was published in 1975 by the *American Journal of Clincal Nutrition*, again raises the fundamental question of the morality of experimenting with children, its validity has been questioned by some scientists because of the use of freshly irradiated wheat. Usually wheat is stored for some time after exposure to radiation. Moreover, critics of this study pointed to the nutritional status of the children used by the scientists. But is seems that the production of abnormal cells, the main result of the study, has not been rejected in general.

Another research report of the same institute warns: "It is clear that irradiation of wheat does not alter the susceptability of the grain to fungal infection but can bring about changes in the grain composition favouring an increased production of toxin." The toxins referred to are extremely poisonous and carcinogenic even in very small concentrations. In this research project only a few out of hundreds of toxin producing fungi have been studied. Besides, in practice the storing conditions are more favourable to the growth of fungi than the perfectly dry laboratory conditions in which the experiments were carried out

Spoiled food looks fresh

At doses used for irradiation, a large number of fungi and bacteria will be killed so that the food items, especially fish and sea foods, appear to be fresh. However, some extremely poisonous bacteria and viruses survive, multiply and contaminate the food There is also a good chance of mutations of these contaminants produced by the radiation which ma) create new dangerous bacteria and viruses.

Another effect of irradiation is its impact on the fruits and vegetables themselves. It destroys the cells of the products and together with that vitamins A, some Bs, C and E. In wheat 20% to 65% of Vitamin Bl is lost after irradiation and storage for eight weeks. In potatoes there is a loss of 28% to 56% of Vitamin C. In meat, radiation alters amino acids and fat.

The health hazards connected with the handling of radioactive substances like cobalt-60 nad ceasium-137 in the process of irradiation are a topic left for another article in *Anumukti* appearing later.

Consumers associations in Malaysia, Japan, Western Euripe, Australia and the US have urged governments and international organisations that the process should not be inflicted on the unsuspecting consuming public while scientists are still arguing over its effects on health. On the other hand, DAE's praises for irradiation have been quoted earlier. What is behind this attitude?

Political reasons

We find the answer to this from the DAE as well, "one of the beneficial applications of atomic energy". Beside hopes concerning the economic profitability of this technology in the future, there are other political reasons behind its development. International research on food preservation by radiation has been sponsored largely by the Pentagon and the US Department of Energy. It wan expected that this way the use of nuclear material would become a common matter of everyday life.

This would help in increasing the acceptability of peaceful as well as military uses of nuclear energy. Showing the benefits drawn from the wastes of the nuclear fuel process, the technincally as yet only insufficiently solved question of waste storage is thus expected to be settled on a political le\el.

Profits are expected from selling this technonlogy to Third World countries which find difficulties in storing and distributing fruits and fish by conventional methods. These countries, on the other hand, want to increase their exports of food products by more effective systems of conservation.

But is this process appropriate for countries like India? Its required capital and its running costs are very high. Therefore, it has been suggested to invest the money needed for its application first into the construction and development of traditional facilities like rat free silos, refrigeration and packing which are cheaper and safer.

Irradiation also means the centralisation of food processing in huge monopolistic complexes dominated by a few industrialists and beaurocrats. The control and regulation of its application itself is a complicated and expensive process posing new legal and administrative questions. Finally, irradiation contributes to a further export orientation of agriculture and food production, the wisdom of which needs to be questioned seriously.

Note : This article is based on material prepared by Ms Hafija Ibrahim from the Consumers Association of Penang, Malaysia, and distributed by Third World Network Features. Other sources are Kalpana Sharma, "Hazards of irradiation", in Indian Express 3-7-'87, and "Atomic Energy and Food Preservation", in Nuclear India. Vol. 25/2 & 3/86, Pp. 8-10.

Alarm Over Safety of Soviet Reactors

The Soviet Union's most popular type of nuclear reactor has come under fire because of their poor record on safety. The Soviet Union builds a large nunmber of pressurised water reactors known as the VVER and exports them to Eastern Europe. Finland and Cuba. A report leaked from the International Atomic Energy Agency (IAEA), which polices the safety of reactors all over the world, indicates that the VVER reactors have one of the worst records on safety.

The report was published by the German magazine *Der Spiegel* The magazine had details of 18 accidents in nuclear plants all over the world between 1981 and 1985 out of the over 250 accidents notified to the agency during the same period. The magazine says that 16 out of the 48 incidents occurred in the Russian built VVER reactors. In 1984 alone Czechoslavakia's largest plant at Bohunice, reported four incidepts to the agency.

Meanwhile another report on the VVER reactors by a nuclear scienntist Dr. Helmut Hirsch and published by the Greenpeace of Vienna is highly critical of their safety. This report looks at a serious accident at Kozloduj in Bulgaria on the 21st of February '83. This accident which was kept secret by the Bulgarian government from its own public is also noted in the IAEA report.

Following an electrical defect two valves were opened in the primary cooling system. As pressure inside the system dropped the reactor was switched off. During the incident, emergency cooling water put into the reactor vessel caused the fracturipg of one of the weld seems. According to the report the accident could have resulted in a disaster.

The first generation of VVER reactors — the 440s built in the sixties and the early seventies may be especially vulnerable. Greenpeace has singled out 10 of these because they have no protection against corrosion inside the pressure vessel. After persistant failure of the containment system, two units built in Finland were fitted U.S. built contain: merits. There are 28 VVER-440s already at work in E. Europe and 14 more under construction.

Source : New Scientist, 7 May '87.
WISE News Communique : 277-2370, 257-2347

Editor's Note

Chernobyl has made the whole world aware of the safety of Soviet built reactors. Chernobyl was a RBMK type reactor and not a VVER type reported above. An Indian team has already visited Moscow to negotiate for the supply of two VVER reactors.

Why are we still at it ?

India was the first third world country to em-bark upon a fullscale nuclear programme. In early 1940's even before the horrors perpetuated on Hiro-shima and Nagasaki made the power of the atom a tangible reality to everyone, Bhabha had envisag-ed nuclear power as the vehicle to launch a newly emergant India into the 'modern age'. Bhabha's dream was shared by Jawaharlal Nehru. Clothed in eloquent prose by him, it captured the imagi-nation of many. The country bidl goodbye to Gandhi and marched down the nuclear path.

In the last forty years much has changed. The world today is a very different sort of place from what it was then. People's expectations and aspi-rations have changed. The path marked 'develop-ment' no longer looks as rosy as it did then. The jargon too has changed from 'modern age' to "21st century'. During the same time there has been a revolutionary change in science. Splitting of the atom no longer seems the Mt. Everest of scientific achievement as it did then.

In this changed context, when the whole concept of 'development' is being challenged by many, it might be worthwhile to reexamine the nuclear energy programme. However, it would be futile to engage in this exercise without first understanding the historical and politico-economic framework within which the nuclear enterprise was undertaken.

It was decades of exploitation of the agricultu-ral, mineral and forest wealth of this country that had been the driving force which had sustained the industrial revolution in England. This exploitation had conditioned the thinking of many who were soon to become leaders in independent India. They were determined to prevent exploitation by forigners and for this the country had to become 'strong' and take its 'rightful place' in the comity of nations. However, to become strong, the only way known to them — the prevalent development paradigm — (Gandhi then as now was good only for lip service) was the very same exploitation and industrialisation. Hence the great stress laid on self reliance and on the core sector of basic heavy industry and the great effort spent in trying to acquire mastery of various modern technologies. In the nuclear field this meant gaining control over all the phases of the entire fuel cycle. The objective was to develop indegenous capability to locate minerals useful for nuclear power and to exploit them in a planner in confirmity with the national interest.

What was true of materials was even more true of knowhow. Modern science was the base for Western technological advancement and the consequent Western domination. Therefore, mastery over technical sophistication was considered essen-tial if we were not to be subjected to manipulation by the 'big brothers'. As Nehru said, "The future belongs to those who make friends with science'[5]. Another facet of this reluctance to be pushed around was to acquire the capability of building a nuclear arsenal if desired — "Keeping the nuclear option open".

There were other secondary factors too in our decision to trudge the nuclear path. Cheap reliable and abundant electricity was seen as a vital element for development. Nuclear power was perceived as one of the awnsers to meet this massive expected electricity demand. There was also the expectation of 'spin off effects.(e.g. food irradiation technology, advances in metallurgy of rare earths etc.) The thinking went that if we could 'deliver the goods' in such a complex enterprise, it would increase confidence in indegenous capability and allow us to do less sophisticated tasks with ease.

A climate of distrust and mutual suspicion between us and the nuclear 'haves' has prevailed during the post independence era. The policies persued by all the nuclear haves throughout this time have only served to reinforce this distrust These policies have swung from total denial of access to nuclear technology in the supersecret early days, to the commercial hustle of the 'Atoms for

Peace' **era** and back to denial as signified by the Nuclear Nonproliferation Treaty (NPT) and the 'Club of London'. Nuclear suppliers have abrogated existing commercial contracts with impunity, (e.g. U. S. enriched uranium for Tarapur) Their behaviour can be characterised as trying to impose a new set of rules midway during the game.

With this perspective let us see where does the Indian nuclear programme stand in todays world context. The primary original objectives of self reliance have already been met and have become non-issues. The country has control over nuclear raw material and an indegenous capability is now present able to deal with them. Similarly a large scientific and technical base is already in existance some of it quite capable of carrying out 'frontline' research. So much so, that the country's continuing poverty and backwardness can no longer be explained away by reference to its scientific unsophistication. Today, when a graduate student can make a plausible bomb design as part of a self study project, becomming a nuclear weapons state too, is no longer a technical but rather a political problem.

Thus todays nuclear objectives are far removed from those which motivated us four decades ago. Today nuclear power is just another way of boiling water to run the turbines. After twenty years of doing just this, nuclear technology can no longer claim indulgance due to a new technology Failures can no longer be airily dismissed as 'teething troubles'. However it is precisely in the field of electricity generation that the nuclear Napoleon has met its Waterloo. Bhabha in 1962 had projected a figure of 20000 M\V to 50000 M\V for 1987 nuclear electricity production. Well, it is 1987 now and we fall short of producing even a 1000 MW. Which other industrey can get away with such unrealistically massive overprujec-tion and such an abysmally poor performance? Now a days the DAE is all set on the figure of 10000 MW by the dawn of the 21st century. Each passing day pushes this pie a little further in the sky. In despair the high priests of the nuclear order have performed an astonishing summersault. They have given the go bye to self reliance and the country is again out, begging bowl in hand, asking our good 'friends' the Russians for VVER plants. These VVER type reactors have an appaling safety record (see news item) and besides they use entriched uranium as fuel. As yet, India has no fuel enrichment facility. We would thus be supplicants of enriched uranium suppliers for the lifetime of the plants. We seem all set for a reenact-ment of the Tarapur drama of the seventies, when the U. S. kept us on a tight 'leash' by releasing small driblets of fuel every few months in an effort to force us to sign the Nuclear Nonproli-feration Treaty.

India's nuclear programme has thus come full circle. We started with the objective of being independent, masters of ourselves, free of domi-nation and manipulation by forigners. It is strange to see us willing to fritter away these hard won gains today just to achieve a target. Of course, all this is one of a piece with the rest .of the '21st century' thinking.

The current of science in the last forty years too has been somewhat unkind to the nuclear enterprise which has been consigned to the back-waters. Giant nuclear plants, with all their attendent risks, inflexibilities, capital intensites, vulnera-bilites, environmental hazards and other ills are beginning to look like dinosaurs at the dawn of the age of mammals. Todays 'breakthrough' areas from high temperature superconductors to genetic enginnering, from high speed computation to designer drugs all involve manipulation at the molecular level requiring very little energy.

The time is thus ripe even within the Nehruvian developmental framework to ponder over the title question. Why are we still at it? Isn't it time we placed the national interest above the vested interst of the nuclear mandarins and their political masters?

Acknowledgements; This paper has borrowed extensively from a paper by J. A. Sabato and Jairam Ramesh which appeared in the March 1980 issue of Bulletin of Atomic Scientists.

S. N. Gadekar

LETTERBOX

In this column we present excerpts from some of the letters we received in the last two months. We are very grateful for any comments, quries and criticisms. All suggestions are carefully discussed and we want to encourage our readers to write to us so that Anumukti really becomes a forund for a wide network of anti-nuclear activists.

Long live Anumukti What a good idea!

L. C. Jain.
Milap Vatica
19 C|UA Jawahar Nagar,
Delhi 110007.

Reads well and easily and the statement of objectives is clear and concise. It fills a much felt need for information on an issue about which open debate has been prevented by a modern fatalism.

Kishore Saint. The
Ashoka Foundation, ll-A,
Fatehpura, Udaipur 313
001.

It had only 20 pages .... Quite disappointing. Hope it will pick up. An appeal for funds may be made in the 2nd issue.

S. K. De
Friends Rural Centre Rasulia,
Hoshangabad-461 001.

Congratulations on the attractive *Anumukti*. I do have very many queries and comments.... The quality of printing is excellent, so the errors are 'original', i.e., in the MSS ....

Whenever you have free space left, you can provide concise information regarding nuclear plants in existance in the country, in neighbouring countries, elsewhere; planned plants; information about individual accidents and their consequences; list of interesting readings in the subject or related readings (e.g., the last issue of *National Geographic* which has an article on Chernobyl; Richard Jeffe-ries' novel from the end of he 19th century. *After London,* Oxford Classics which provides a powerful pre-view of a world ruined by man's 'progress'; of Huxley's *Ape and Essence* (1948), a horrifying dystopian prophecy, written right after World War II, projecting forward to a world after World War III; etc.)

Sudhakar Marathe Dept of
English University of
Hyderabad Golden
Threshhold Hyderabad.

It is encouraging to see such a journal in India, where there has been such a surprising lack of debate and controversy about nuclear power and (even rather little attention to nuclear explosives.)

Jim Forest
International Fellowship of
Reconciliation,
38 Spoorstraat, 1815 BK
Alkamar, Holland

Regarding the *Anumukti* format It is good that at last a linkage has been established among Indian anti-nuke activists. But I feel that the magazine's format has to be changed. Long articles like the one written by me should not be published. At best, a short half page condensation should have been sufficient with a note at the end to contact the author for a detailed article. Contact addresses of all should be given without fail. The purpose of the magazine is to strenghen the link .... I feel there should be a separate editor for every issue and he should write an editorial. It could be cyclic.

Nagesh Hegde CANE,
138, 5th Cross, 1st
Phase J. P. Nagar,
Bangalore 560 078.

How one wishes that nuclear energy was never discovered! But persuit of science is relentless and it is basically amoral. Once man discovered fire, it was up to him or her to use it for cooking or heating or for burning down the whole of a Khandava Vana as was done under the supervision of Arjun and Krishna of the Geeta fame! Now with the discovery of atomic energy, we might have come a long way but the basic dilemma of science persists. Unfortunately for us, all sources of energy, fire, wind, coal, oil, steam and electricity have political implications. History is replete with instances to prove a general statement that those communities and countries which were negligent in mastering energy were either wiped out or had to become subservient to those who had learnt to master it. India's history is in no way different. We lost to the British not because we lacked in bravery, but because we had not the fire-power the British troops had nor the organisational and techni-cal discipline that the Western scientific knowledge had generated in those days.

As the strategic implications of having and not having nuclear power at our disposal are too ob-vious, I need not dwell on them at length, If and only if. China, Russia, Pakistan and India sign a nuclear free zone agreement, would T be willing to insist together with you on our government to stop developing nuclear weaponary. But for any suggestion of this kind from India to be taken serious note of, India will have to develop its own nuclear capability. Moreover would it not be just criminal on the part of any government to order its army to march against an enemy who can destroy not their lines of supply alone but their supply basis within a few seconds? Personally speaking 1 would prefer India prepared to get destroyed together with the enemy to India living in slavery for another thousand years.

Your objection is, if I have guessed correctly, basic, that is you are against the splitting of the atom. I think it is too late in the day to lake that position. It is like trying to unscramble an egg. I live in the hope that scientists will find some way to separate nuclear energy from its attendent destructive elements; that they will know how to control the BRAMHASTRA, they have involked.

Today you and your friends are striving for a "non-nuclear" India. Tomorrow there,might dawn the age of the super conductor, heralding a new epoch of technology with its own package of side effects. USA, USSR and Japan have alred y reached the threshold. It will again have tremen-dous political implications. Should we then insist on a non-super conductor India? Science, especially modern science, will not allow any country to put the sign of "no entry" on its portals.

However, let me congratulate you on your bold effort to demystify the nuclear issue. That will show the pitfalls and prevent the government from taking the whole nation for a ride.

N. G. Goray
5511, Aylesboro Avenue
Pittsburgh, PA 15217
USA.

GLOWING ON THE JOB

Records obtained by the Public Citizen from the United States Nuclear Regulatory Commission (NRC) reveal that over 93000 workers at 83 nuclear plants were exposed to measurable amount of radiation in 1985. (The most recent year for which NRC has compiled data). A report from the Public Citizen's Critical Mass Energy Project finds a dramatic increase in the number of exposed workers as plants age. For example, the oldest plants—those which began operating in the 1960's — exposed their workers to four times as much radiation as the newest plants.

Other findings include

* Worker exposure levels have continued to worsen : the figures represent a fourfold increase over the number of workers exposed in 1975 while the number of operating reactors increased by a factor of two.

During the same time, the average of nuclear workers exposed to radiation at each reactor nearly doubled : from 579 workers per reactor in 1975 to 1132 workers per reactor in 1985.

* Temporary workers run the highest risk : while they represent one half of the nuclear work-force, in 1984 they received about two thirds of the total radiation exposure. Temporary workers can receive their maximum allowable dose at one nuclear power plant and then be employed at another plant thus receiving two or three times the allowed amount. The number of temporary workers has doubled in the last eight years.

* The problem of worker exposure to radiation is most acute at the 28 Boiling Water Reactors (BWR) in the US. On average workers at BWR's received 30% more radiation than those at other reactors. One BWR, the Susquehanna reactor in Pennsylvania, exposed 3669 people to radiation, more than three times the national average.

* Thirty reactors exposed their workers to levels of radiation higher than the NRC's "allowable" level for the general public. Three reactors — the two at Peach Bottom in Pennsylvania and the Mill-stone-2 reactor in Connecticut — each exposed their employees to three times as much radiation as the a\erage plant did in 1985.

Rather than take measures to reduce this hazard, the NRC is considering rule changes that would actually increase exposure levels. For example, it is proposing to increase the amount of radiation allowed for each worker, even though the limits are alredy 10 times higher than government recom-mendations and 680 times higher than the standards set by the Environmental Protection Agency for the general public.

Source : WISE News Communique : 275,2350
Editor's Note : Susquehanna BWR figures, (the worst US case), are old hat for Workers at Tarapur. The Tarapur plant has been regularly exposing between 3000 to 4000 workers year after year to radiation dosages from twice to thrice the average dosage to radiation workers at US plants.

Protest in Gujarat

It was raining as 6th August dawned. But that is usual; this part of south Gurajat gets a great deal of rains (75"/year) most of it during the monsoons.

Last year a rally was held at Bedkuadoor, about 3 Km from the site of the up coming nuclear plant at Kakrapar. This rally organised by Anu Urja Jagriti and Sampoorna Kranti Vidyalaya Vedchhi was to commemorate the Hiroshima vic-tims and to protest against the building of nuclear reactor in their midst. The police had resorted to lathi charge, tear gas and firing in an effort to crush people's opposition.

With memories of last year still fresh in mind, most activists were reluctant to organise another confrontation this year. Throughout last year many attempts had been made to increase mass contact with the local villagers so that a disciplined nonviolent force could be raised. But most activists still felt unsure about the discipline and peaceful-ness of the people at large. Consequently it was decided to hold a large number of prayer meetings in different villages around the plant. It was felt that this decentralised form of protest would help in maintainance of peace and at the same time allow larger numbers to participate in the protest.

The police had other ideas. Their 'bandobust' was on a scale larger than last year's. A comple-ment of 8 trucksfull of police; some brought from as far away as Bhavnagar and Valsad, with 6 horses and the usual number of officers descended on Kakrapar. They promulgated sec. 144 in the area and stopped all vehicular traffic. All this show of force was assembled, not at the site of the plant, but at the side of last year's rally.

The authorities at the nuclear plant contributed their bit by conducting a survey of a 10 Km radius area in July. This was presumably done as part of an exercise in emergency preparedness. But as is the usual practice, people were not taken into confidence regarding the purpose of the exercise, the authorities fearing that information shall lead to panic. Rumours of all kinds were thus rife and people were tense.

It was in this state of tension that 6th August dawned, raining as usual. People in villages near Kakrapar who had been contacted by the activists went about their daily tasks undeterred by the massive police contingent in their midst. They held prayer meetings, passed a resolution demanding closure of the nuclear reactor and sent letters to the same effect to the prime minister and the chief minister of Gujarat. But for the people from the far off villages, whom the activists had not contacted, the police conglomeration itself acted as a magnet. They felt that the police would not have gathered in such numbers unless a demonstration was hnmi-nant. About four thousand people walked 15 to 20 Kms in the night and gathered near the spot where the police were encamped.

The prescence of the police acted as a provocation. They were encamped near a cycle shop. Last year too they had campad near the same place. The villagers considered the shop keeper to be a betrayer. Some of them picked up some cycle tyres from the shop and set fire to them. This was enough excuse for the police to launch tear gas shells. The crowd resorted to stone throwing. The police replied with bullets.

There were 16 arrests. Those arrested were kept in the Vyara police lock-up for four days, as presumably investigations continued. They were initially charged under the newly enacted terrorist act but the magistrate refused to entertain these charges due to lack of evidence.

The news released by the Surat rural police for the newspapers and the radio tried to involve Narayan Desai with the stone throwing incident. There were also rumours to the effect that the police made efforts to implicate Narayan Desai with the violance and to arrest him as a terrorist but the idea was later dropped.

Surendra Gadekar

Nuclear News From Karnataka

The Karnataka government is finally making arrangements to send study teams to various nuclear installations in the country, in order to fulfill its long standing promise to convince its people about the feasability and the safety of nuclear technology. Four teams of five members each will visit Tarapur, Jaduguda mines, Kota, and Kalpakkam by mid October. People selected for this tour are from the North Kannara district in which the Kaiga nuclear plant is proposed to be set up.

The chief minister had proposed such a study tour two years ago, after a public demonstration against the Kaiga project. However the Hegde government had not taken any steps towards fulfil-ling its promise till the question was raised during a crowded press conference where the chief minister had to renew his promise.

All the 20 members of the study teams have been contacted by the government. Each team con-sists of one MLA, one learned person (like princi-pal of a local college), a journalist and two other local people. The leading anti-nuke group CANE (Citizens Against Nuclear Energy) is preparing background materials for the teams.

Protests Galore

Karnataka is the only state in India which harbours all the different segments of the nuclear 'fuel cycle', from uranium mining in Arebail in a fuel processing and uranium enrichment plant under construction at Ratnahalli, from the con-struction of a nuclear reactor at Kaiga to the investigation into feasability of a high level waste depository at the Kolar gold field; Karnataka has them all. Thanks, are probably due to an excess of local feeling in Dr. Raja Ramanna and Dr. M. R. Srinivasan both of whom hail from Bangalore. This uncalled for intrusion into their lives has caused resentment in many and has resulted in the springing up of many groups ready to protest the activities of the nuclear empire.

The Rare Earths Materials Plant (REMP) at Ratnahalli near Mysore city needs to be watched by every anti-nuclear group in the country. Six years ago the Indian Rare Earths began its secret activities here by building a 20' high wall on the shore of the Kannambadi reservoir along the river Kaveri. Huge pipelines and massive electricity cables were laid without any questions being asked. Local newspapers began sporadic reporting last year about the possibility of a uranium enrichment facility coming up at this complex. But for Tarapur, all Indian reactors operate on natural uranium. Tarapur is in any case destined for closure by 1992. Enrichment would hence be a step essentially in the direction of nuclear weapons production. The enrichment process requires huge amounts of energy. Thus, the facility would besides posing a grave threat to the people and the environment would be a drain of hugh energy reserve and it would be interna-tionally controversial. The DAE has, however, casually brushed aside the bomb production rumour without giving any other plausible explanation for the sudden spurt of secret activity at Ratnahally. People of Mysore — the mayor, university profes-sors, PUCL activists and students have seriously questioned these secret operations. However, till now no question has been raised in the state as-sembly. So much for the democratic set up.

Young people, especially students are taking up the REMP and Kaiga issues very seriously. Wall writtings have appeared in major cities like Bid ar, Gulbarga, Raichur, Chitradurga, Mysore and Bangalore. A rally was organized in Chitra-durga on July 17th in which about 600 people participated. A state level seminar was held in Bangalore on August 2nd. Four days later a rally was held in Bidar. Chitradurga witnessed a bandh on 14th of August during which 400 students sub-mitted a memorandum to the district commisioner demanding a halt to all atomic activities in Karnataka. The students under the common banner of 'Progressive Youth Centre' then went to

Mysore and mobilized a large number of students there with the help of slide shows, street plays and video films. There has thus been a mobilization of a large number of people in and around Ratnahally.

Professor Vistimised

Meanwhile, Professor Ramalingam of the department of Botany at the university of Mysore has been transfered to the Karnataka university at Dharwar. He had been the most vocal among the academicians on the question of the location of the REMP complex. Undeterred by this 'punish-ment' he has continued to address other student rallies.

"Stop Kaiga Memorandum"

The signature campaign launched by CANE appealing the Prime minister of India to stop the Kaiga reactor, is gaining momentum. Many prominent writers, poets, artists and senior citizens have signed the statement. It may be recalled here that some 135 environmentalists from 32 countries who had attended the 'Global Develop-ment and Environment' conference at Penang in April, had signed a similar memorandum. Besides, some 75000 local residents of the North Kannara district have already signed the memorandum.

Nagesh Hegde CANE

Shri Nagesh Hegde is a journalist and a social activist Contact Address : C|o. CANE, 138, 5th Cross, 1st phase J P Nagar, Bangalore 560078

KAIGA MEMORANDUM

TO **The Prime Minister of India**

We oppose the Government's decision to site a nuclear power plant at Kaiga in the heart of a precious patch of rainforest. The small hit of this unique biosphere remaining should not he exposed to the hazards of radiation and other developmental projects.

* Nuclear wastes and dead nuclear plants in this river belt exposes future generations to radiation hazards by contaminating the land, water and air.
* Concentration of large dams, a naval base and the nuclear plant turns this area into a high security risk.
* Scientific energy management and tapping of safe and renewable alternative sources will meet all our energy needs.

ON BEHALF OF THE COMING GENERATIONS WE OPPOSE NUCLEAR POWER PLANT AT KAIGA.

Name	Designation & Address	Signature

Please Send this signed memorandum to : Citizens Against Nuclear Energy (CANE). 138, 5th Cross, 1st Phase, J P Nagar, Bangalore-560 078.

CAN 136 *INTREPID SOULS KEEP THE NUCLEAR WOLF AT BAY?*

May be for an issue or two *ANUMUKTI*
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Editor ANUMUKTI Sampoorna
Kranti Vidyalaya Vedchhi, Dist.
Surat-394 641

Any donations over and above the subscription amount will strengthen our joint effort towards a non-nuclear India and would be greatly appreciated.

Notice Board

Antnukti needs to become an effective medium through which anti-nuclear activists can communicate with each other. As part of this effort we are starting this section, giving information of forth-coming events, appeals for help,-etc.

Please send us names and addresses of any contact person at Tarapur, Jaduguda, Rawat-bhata and Kalpakkam who could supply us with relevent and correct information during our visit. We shall be visiting these places in mid | late October.

Nagesh Hegde CANE

BARCOA (BARC Officer's Association) is arranging a panel discussion on "Issues in Nuclear Technology" within the BARC campus, Anushakti Nagar, Bombay on the 10th of October '87. The panelists shall include Dr. P. K. Iyengar, Mr. S. L. Kati. Dr. A. K. De, Mr. Prafula Bidwai. Mr. Dhirendra Sharma, and Mr. Ivan Fera among others. Anumukti welcomes this initiative of BARCOA.

Contact Person : Dr. Gautam Chattopadhyayu 1, 2-346-s Modular Labs BARC, Trombay, Bombay-400 085. A 3 day workshop of antinuclear activists and students is scheduled for November '87 in Delhi.

Contact Person : Tripta Batra
C|o. Prafula Bidwai, Times of India, 7, Bahadur Shah Zafar Marg
New Delhi 110 002.

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Subscriptions, donations, enquiries regarding circulation etc. should be addressed to :
Editor Anumukti,
Sampoorna Kranti Vidyalaya,
Vedchhi, Via Valod,
District : Surat 394 641.
Editor : Surendra Gadekar
Printed at : *Topstyle Press,* Old Danapith,
Shahpur. Opp. Rajaji's Pole. Ahmedabad-1.

An International Meeting of Concerned Scientists and Citizens for 'Nuclear Free World-Order' will be held in India during 8-15. January, 1988. Participants will include parliamentarians, public policy analysts, social scientists, nuclear scientists, anti-nuclear activists, and mediamen from many continents. The deliberations will be divided in 3 Sections:

A. *PUBLIC POLICY ISSUES*
B. TECHNOLOGICAL PROBLEMS
C. *DEFENCE & INTERNATIONAL SYSTEMS OBJECTIVE :* International Meeting aims to provide a critical assement of nuclear systems and suggest paramfetres of nuclear free world strategy.

LANGUAGE : English and Hindi will be the medium of the conference.

PROGRAMME : The programme will be finalised by the end of October. Tentatively the organisers plan to hold conferences at two major cities in India :

NEW DELHI : January 8-10,

BANGALORE : January 1214,

COST : The organiser (COSNUP) will arrange and pay local expenses — conference facilities, accomodation (in-family residence), and meals of participant. Due to banking restrictions travel costs will have to be arranged by each participant. A small registration fee will be charged at the time of the Meeting. Those who would like to stay in hotels|guest houses can be assisted in finding suitable accomodations.

THE COMMITTEE FOR SANE NUCLEAR POLICY (COSNUP)
M-120, Greater Kailash, New Delhi-110 048,

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol. 1 No 3 December 1987

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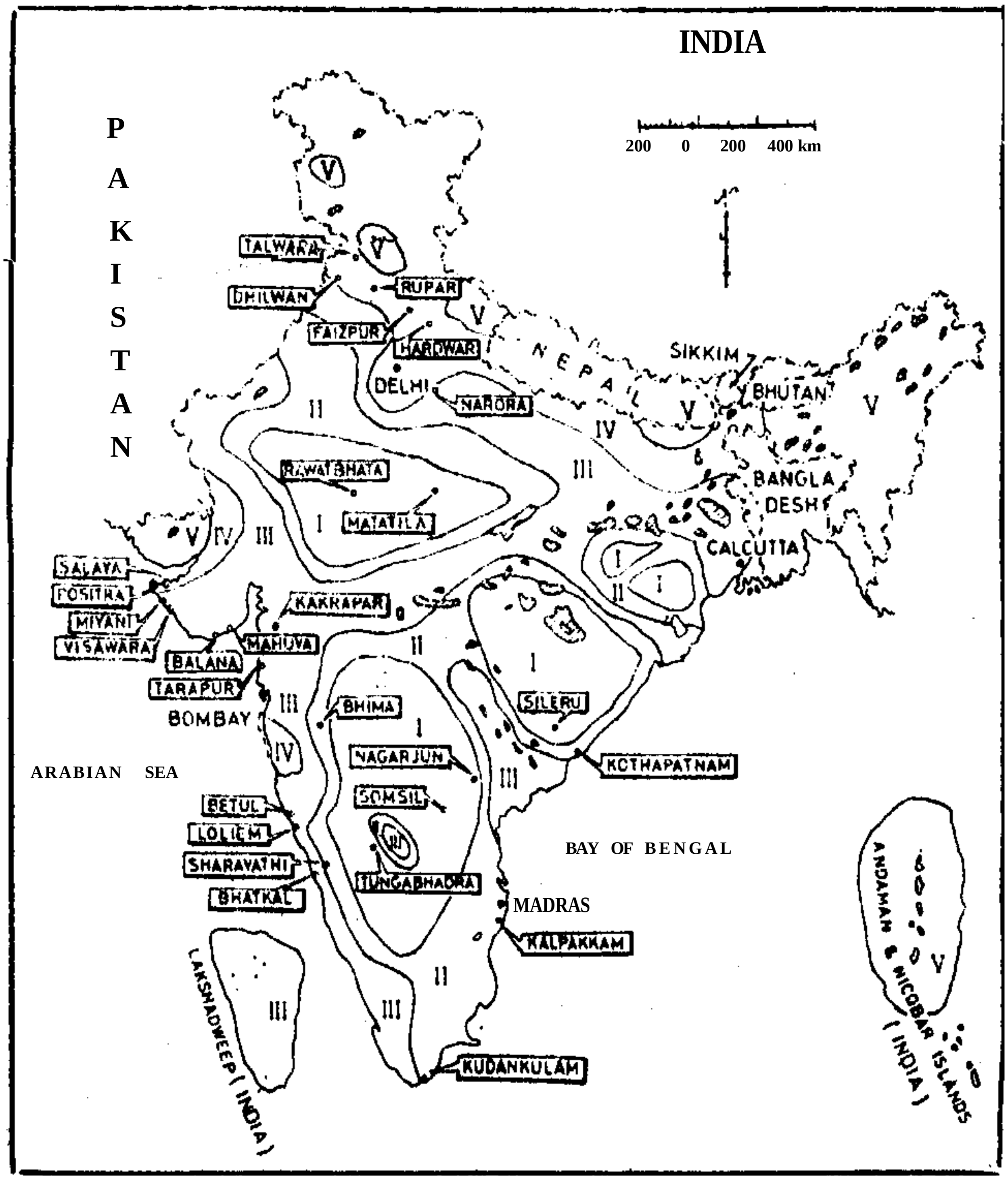

SITES INVESTIGATED FOR NUCLEAR POWER PLANTS

Seismic Zones I, II, III, IV & V correspond to V & less, VI, VII, VIII & IX on the modified Mercalli intensity sale

Shaded areas depict coal deposits

In September 1970, Government of India constituted a national committee under the Chairmanship of Shri V.R. Vengurlekar to study in depth and recommend a panel of suitable sites for setting up nuclear power stations. The modus operandi adopted by the committee was to have site investigations carried out by agencies of the different states concerned On the basis of all the accumulated data the committee made comparative evaluations of various sites.

The recommendations of the committee have never been made available to the public, despite repeated requests.. However, the International Atomic Energy Agency (IAEA) and the OECD Nuclear Energy Agency jointly organised a symposium on 'Siting of Nuclear Facilities' in Vienna from 9-13 December 1974. In it a member of the National Site Selection Committee Shri L. Venkatesh and T.P. Sarma of the Health Physics Division of BARG presented a paper entitled 'Siting of Nuclear Power Stations in India.' This paper contains the map published on page it as well as a set of guidelines which were used by the committee to determine the relative merits of different sites. The symposium proceedings were published in a book form by the IAEA in April 1975 I strongly recommend this paper as also another by S. Krishnamurthy and S.D. Soman on siting considerations for fuel reprocessing plants (details in the next issue of *Anumukti)*, to all antinuclear activists in the country. Unfortunately access to this paper is not easy. Therefore in the following I shall highlight some of the points discussed in the paper.

Site Selection Criteria

Site Selection depends to some extent on the proposed type of reactor. The Indian programme is based primarily on the natural uranium fueled, heavy water moderated CANDU type of reactors. All sites were evaluated on the basis of their suitability for setting up CANDU reactors of 1000 MW (c) capacity in stages. (Thus, existing reactor sites, e. g. Tarapur, Rawatbhata, Kalpakkam are likely to have additional units constructed on them.)

Distance from coal deposits

Even after recourse to creative bookkeeping it makes no economic sense to locate, nuclear power plants in regions with large coal fields. The breakeven distance from coal fields beyond which nucler power is expected to be cheaper depends on nuther of factors like pithead prices and the trasport costs of coal, the difference In capital costs in the construction of nuclear and coal powered units the unit size adopted for nuclear units, etc. Estimates of this breakeven distance range from 500 Km. to 800 Km from pithead.

Water requirements

Nuclear power plants are thirsty monsters. They require enormous quantities of water for both process cooling and condensor cooling. The amounts required for a 1000 MW (e) station are 300 cusecs of freshwater for process cooling and 2500 cusecs for condensor cooling. Thus nuclear power stations can only exist near large (1200-1500 acres) reservoirs or canals or on the sea coast with some additional freshwater availability. Even with these huge amounts the temperature of the outgoing condensor water gets raised by 8 degrees centigrade. This outfall water when let into a reservoir forms warm water zones which deplete the dissolved oxygen in the water and consequently provs fatal to fishes.

Condensor water is also used for disposal of liquid radioactive wastes during normal operation at coastal stations. In other words, the sea is used as a dump not only for the heat but also for the radioactivity. At inland sites where water is needed for irrigation and other community uses, this philosophy of dilution and dispersal comes a cropper. Inland sites thus need large cooling towers and storage ponds for chemical treatment and subsequent controlled release to the environment.

Electrical system

Nuclear plants are extremely capital intensive with comparatively low fuel costs and hence it is best to utilize them to the maximum extent, possible. (In technical jargon—for base load with high load factor.) It is necessary that a good part of the power produced should be absorbed quickly after start-up to avoid problems of poisoning the reactor. This can be achieved satisfactorily only if there are large industrial loads in the grid in the vicinity of the plant which can come on line swiftly.

For the satisfactory operation of the plant an assured supply of adequate start-up power of appropriate voltage from the grid is essential. The capacity of the nuclear plant should not be larger than 15% of the total capacity of all the generating units in the grid. Weaknesses in the grid can cause frequent tripping. The choice of the site of India's first CANDU reactor at Rawatbhata in Rajasthan was subsequently strongly criticised by a review committee appointed by the DAE itself (Prasad committee). The poor performance of the reactor was blamed on weaknesses in the grid.

Foundation conditions

The geologic stability, the seismic susceptability and the tectonic features of the area are extremely important from the viewpoint of nuclear plant safety. The nature and the magnitude of any possible future earthquake needs to be accurately estimated from geophysical field experiments. This information helps in determining appropriate design parameters for the station structures, equipment and safety systems. Unfortunately, the science of earthquake prediction is still in its infancy the world over. Even in an extensively studied region like California, last month's (1. 10. '87.) Los Angeles earthquake was on a previously unknown fault. In India, as it is, the available local seismic history is rather short. As recently as December 1967, the peninsular shield of India was considered one of the stablest regions of earth free from all seismic activity. The Koyna earthquake put paid to all such comforting theories. Today, some experts believe that human intervention in the environment, e. g. in the form of large dams, can by itself be the cause of alterations in the geologic stability. Therefore, the zones should be taken only as indicators of previous seismic history and not be considered too seriously as determinants of future earthquake activity. In the aftermath of the Koyna earthquake, changes were instituted in the design of CANDU reactors as it was found that the design adopted for Rawatbhata and Kalpakkam was inadequate to withstand moderate intensity tremours. God help us if as a result of the Narmada project there are changes in the stability of Madhyapradesh—Rajasthan region.

Environmental conditions

In the normal course of operations, nuclear plants pollute the environment through controlled releases of radioactive nuclides in the form of gases. The acceptability of such releases at a given site depends upon the disposal capacity of the environment, the concentration and transport processes of radioactive products in the neighbourhood of the site, utilization of the environment and radiation safety standards. Under accident conditions, plant behaviour is not under control and large releases of radioactivity to the atmosphere may take place. It is because of this fear of disasterous accidents that plants are situated in areas of low population density. Population distribution near the site, meteorological conditions, ground water 'flows, local environmental utilization are all needed for site evaluation. At present, no residential population is permitted within 1.6 km of the plant and up to 4.8 k.m is only thinly populated. Administrative measures are used to restrict the growth of communities around the plant. Care needs to be taken to see that the predominant wind directions are not towards any major population center. In fact because of the frequent storms, hurricanes, heavy littoral drift, etc. most of the east coast of India has not been found suitable for reactor siting.

Access

Nuclear plant sites need to have good all weather roads connecting them to equipment manufacturing places as also ports of entry. The largest single piece involved for a 235 MW (e) unit is about 7.5 metres long and has a 7m diameter and weighs about 75 tons. For a 500 MW unit a single piece may weigh anything up to 280 tons. Movement of such heavy equipment to the site by tractor-trailer combination over long distances present many problems. Great length of roads concerned need to be surveyed and improvements made in bridges and culverts as well as changes made in road alignments and curves. All this takes a great deal of time.

Conclusions

The moral of the story for the antinuclear activist :

Ideal nuclear sites are hard to find. There are many exacting preconditions, some of them mutually contradictory (low population density and close proximity to large industrial centers) which need to be fulfilled by an adequate site. In its eagerness to promote nuclear power, the nuclear establishment has made choices like Rawatbhata which later experience has taught it to rue.

Any serious attempt to achieve the projected target of 10000 MW by the year 2000 AD would mean the prompt (next 2-3 years) acquisition of many of the sites shown in the map.

A strong antinuclear movement specially concentrated around the sites in the form of well organised local groups can still prevent large scale nuclearisation of India. It is not yet too late.

Besides the points discussed above, Indian reactor sites pose a special hazard. The whole programme is based on the reprocessing of spent fuel to extract plutonium. Transport of highly radioactive spent fuel between reactors and reprocessing plants is hazardous. Considering the road and traffic conditions at present in the country DAE proposes to build small reprocessing plants right next to the reactors. Unfortunately this remedy is worse than the disease it seeks to cure. Reprocessing plants arc a bigger menace to the surrounding environment than even reactors. The concensus of opinion the world over has been either to dispense with reprocessing alltogether or to build large central reprocessing facilities and take the transport risks. In the next issue of *Anumukti I* shall discuss siting criteria for reprocessing plants.

Suraidra Gadekar.

LETTER BOX

Each era has had to face some challenge to the continuation of civilisation. However, mankind has managed to turn back from the precipice in time to save itself. I hope we still retain enough sanity to be able to solve the issues concerned with use of nuclear energy. The other side of the coin is that every new invention has brought in its wake a group of people who have felt that the new invention may lead to doom. May be, their constant vigilance and warning is what has lead to 'taming' of the new invention enough to control its capacity for doom. However, if we have as a race met all these past challenges, why should we doubt that we can and will do so once again ? No doubt, there must exist and thrive a band of vigilantes who take up such issues and work as the voice of conscience and sanity. Secondly, I feel that in the context of the world situation as it exists today, your voice of reason and sanity is too weak to be heard or to have an impact.

Sharad Shirodkar
Bombay

It was interesting to hear about the work against nuclear industry in India—I keep wondering how one can oppose both nuclear weapons and nuclear power in a non-adversarial way. I have found in the U.S. that we arc a ' 'nation of protest movements"—not a nation of peace movements. I have recently written a book called "WAYS OUT, a book of changes for peace'. 1 find Gandhi's constructive protest a wonderful resource. 1 do not believe we can ask people to give up jobs in nuclear industry without carrying them a gift of some alternative possibilities for work.

Gene Hoffman
Santa Barbara, California

This is in response to the letter written by Shri N.G.Goray (Vol. 1 No. *2*, October, 87). He seems to live under an illusion that scientists will find some way (one day) to separate nuclear energy from its attendent destructive elements and further that they will know how to control the BRAMHASTRA they have invoked. Any dillemma of science is also the dilemma of our entire civilisation. But for him the problem of nuclear energy seems to be the persisting diemma of science alone. If one knits his emphasis on mastering energy (underlining the national and intcrnattional politial implications to enforce hierarchy) and the question of signing of a nuclear free zone agreement amongst China, Russia, Pakistan and India (a most improbable event) one finds that his vision is that of a nuclearised India living under a conceptual deception known as the 'doctrine of deterrence'. We should instead strive for a non-nuclear India and a nuclear free world in the interest of preserving both ours and the global civilisation.

R.Mani Vannan
Delhi

Save The Western Ghats-March

About an year ago, environmentalists working in different voluntary organizations in South India-Kerala, Tamil Nadu, Karnataka, Goa and Maharashtra, met in Goa to discuss the environmental problems of this region and share their experiences.

These discussions brought out the important role played by western Ghats in India's environment, cultural life and economic development. The Western Ghats which rise in the hills of Southern Tamil Nadu stretch out into a range in Kerala, Karnataka, Goa and Maharashtra. All the eastwards flowing rivers of South India originate in the Western Ghats. The high rainfall region of these Ghats contain an invaluable wealth of flora and fauna. They provide the raw material for an innumerable number of artisans in the region. They contain the most varied kind of Horticultural gardens of Rubber, Coffee, Pepper, Cardamom, Areca and Coconuts, In short the Westernghats are a backbone for the economic well being of the entire southern part of India.

However, in the last few decades, the Western Ghats have been exploited beyond reasonable limits under the pretext of 'development'. The hydroelectric projects built to support a chain of heavy industries have destroyed lakhs of hectares of pristine forests. Vast tracts have been felled to provide raw materials to industries. Mining activities too have had their toll. These areas continue to be barren even after all mining activity has ceased. Valuable trees have been felled to meet the needs of the rich urban dwellers and for export. In the long term these activities will convert this unique ecological niche into a desert. Further there is fear of major earthquakes on account of the gigantic dams built in this region. The faults oserved under the Supa dam are indicative of this danger. Together with this, bad management of the forest resources by the people, such as attempts to cultivate hillslopes, deforestation to meet the fuelwood and green manure needs and unrestrained grazing by cattle, goats and sheep have further degraded the Western Ghats.

In Karnataka, the environmental problem has been compounded by the presence of several factories that have been polluting the environment on a massive scale-along the Tungabhadra, at Ammasandra, Nanjangud, Karwar, Mangalore and Bhadravathi. The Kali, Varahi and Sharavathy Projects have caused large scale destruction of green forests. Thousands of hectares of village common lands have been transferred to Karnataka Pulp wood Ltd., a Joint Sector Company for raising of eucalyptus plantations for industrial needs. On the pretext of energy short fall, a nuclear power plant is being planned at Kaiga. The problems of people uprooted from the sites of these various schemes have multiplied over the years and spread from Ramanagar to Kadra, Kodsalli and Kaiga.

After seven months of preparation and involvement of over 150 voluntary organisations Save the Western Ghats March began on November 1st from the southern tip at Kanyakumari and the northern tip at Navapur towards Goa.

The organizers hope and are working towards identifying concerned young men and women who can be important part of this people's movement and can fecilitate the organizing of the affected people who could take initiaive in planting trees on large scale, try to bring pressure on the authorities and preventing further denudaion of the Western Ghats and also bring the Wastelands to productivity to meet basic needs of rural and tribal people especially the poor e.g., fodder for cattle, fuel for cooking, raw material for artisans, small timber for housing, green leaves for manure and fruits. As one organiser said "the basic responsibility of preserving and sustaining the environment and ecology is best left to the people, bureacracy and state playing the role of an enabler (Not produer, as the forest bureacracy has tried and failed). Only awakened people can act as safeguard against further destruction of environment and also regenerate the barren areas to meet their basic needs".

The experiences of the Marchers from both ends will be shared in the two day meeting on January 29 and 30, 1987 in Ponda, Goa. This is followed by a three day Conference, where the Marchers together with other Environmentalists and concerned persons will evolve a long term strategy and possible organizational framework for the Central involvement of people for restoring and sustaining the ecological balance for the Westerm Ghats.

The effort which is taking the shape of the people's movement has the potential to contribute not only to the saving of the Western Ghats, a significant and basic part of .the ecology of the Southern India but also save the whole country and world from the ecological disaster.

Kumar. Kalanand Mani
and Sri. S. R. Hiremath

C/O. Samaj Parivartana Samudaya (SPS)
"Ashadeep". Jayanagar Cross. Saptapur,
Dharvad-580001, Karnataka.

The Brazilian Horror

"Never have I seen such a tragedy", affirmed the physicist Jose Rosenthal of CNEN (the Brazilian Nuclear Energy Comnusion), referring to the spread of radioactive cesium-137 in the central Brazilian town of Goiama. The accident involves approximately 100 gms. of Cs 137, 'an amount similar to the total Cs fallout on the whole of West Germany following the Chernobyl disaster) and has alredy claimed 4 lives with 40 more hospitalized of whom many are not expected to survive.

In Brazil workers arc legally required to provide their employers with X-ray photographs of their lungs. This has led to the proliferation of private radiological clinics set up by people with lot of money and no scruples. The cesium in powdered form was contained in a lead box found by some men in an abandoned radiology clinic. They sold the lead cask to a scrap metal dealer who opened it. Reports say that people present were fascinated by the luminosity of cesium and started, playin with it. Maria Gabriella, the 6 year old daughter of the scrap metal dealer rubbed the powder all over her body and paid for her innocent, exuberance with her life.

The powder has contaminated a whole neighbourhood. People took the glittering powder home to show it to their family and friends. When the horrible symptoms started appearing they tried to wash it all off thus contaminating the water drains. Then panic gripped the city. Its one million citizens became national pariahs. 30,000 people visited control posts in a ten day period, Business in the city fell by over 60%. Not many people wanted to buy food or clothing for the fear of contamination. Many abandoned their homes. People had to produce certificates from the CNEN testifying their radioactive 'cleanliness'.

The tragedy has highlighted the total confusion and un preparedness of the authorities. When news of the accident became known, 42 technicians from CNEN travelled to Goiania, where many of them worked without proper protective clothing. The machines brought for measuring radioactivity quickly broke down, the measurements were inaccurate and one technician as well as four policemen were contaminated. The patients were transfered in ordinary ambulances which were used without decontamination for days. The hospitals did not have enough disposable clothing nor isolated rooms for the victims. At least two nurses and one doctor were also contaminated.

The problem of what to do with the radioactive waste has not yet been solved. The football stadium where the victims were first brought for checks needs to be decontaminated There were suggestions that it be washed and the grass burnt. Unfortunately radioacctivity cannot be got rid of so easily : The water will run into the sewer system and fire will make the radioactive particles airbourne spreading contamination far and wide. Cesium has a half life of thirty years and thus contaminated material can remain a threat for hundreds of years. It is for this reason that the residents of the city do not want burial of the accident victims in the city cemetry though they have been placed in coffins with layers of lead and concrete each weighing 600 kg.

Source : WISE news communique 281.2428; 282.2843
The Telegraph : 4.11.'87

Protest against Kaiga

Peace activists wearing distorted masks and spotting snappy anti-nuclear badges and T-shirts marched along with their children to Raj Bhavan on November 15th morning, simulating the horrors of a radioactive environment, to oppose the Kaiga Nuclear Plant as well as the ongoing atomic 'projects in the state of Karnataka.

The marchers belonging to the Citizens Against Nuclear Energy (CANE) dropped flat every 50 feet on the way-(they call it 'rod show') stopping curious pedestrians and motorists.

The silent processionists presented a memorandum to Governor A. N. ,Banerji urging him to convey to the Centre their "no" to the Kaiga Plant, Ratnahalli Uranium Plant, uranium mining at Arebail and to the reported nuclear waste disposal plant at Kolar Gold Mines.

A "Statement of Public Concern" signed by 60 prominent citizens and expressing serious concern at the "sudden spurt" of nuclear related activities in the State during the past two years was also released on the occasion.

The statement signed among others by Gorur Ramaswamy Iyengar, Dr. U. R. Ananthamurthy, Prot. Gopalakrishna Adiga, Dr. Siddaiah Puranik, Dr. Shivaram Karanth, Dr. H. M. Nayak and Dr. G. S. Shivarudrappa. It demanded at least a Moratorium on the Kaiga nuclear plant and the Rs. 350-crore Rare Earth Mineral Plant (REMP) at Ratnahalli' near Mysore till au impartial analysis of environmental impact was made, public hearings conducted and a national debate on nuclear energy question held as promised by the Prime Minister.

They also demanded the immediate repeal of the Atomic Energy Act of 1962, release of information pertaining to all nuclear related activities in the State, setting up of ail energy information cell, evolution of methods to expose every MLA and MP to the factual information on energy economics and nuclear truths and. making of the Atomic Energy Regulatory Bo?rd fully autonomous.

Briefing reporters, CANE members Suresh Heblikar, Mr. Nagesh Hegde and Mr. H, S. Doreswamy said the Kaiga plant, besides exposing the forests and the Kali river to radiation, also involved a security risk with the concentre tion of large dams and a naval base.

The Rare Earths Plant at Ratnahalli was consuming 66,000 KW of power from the State grid and one lakh gallons of water from the KRS dam. They maintained that the enriched uranium produced form the plant would be of no use to any of the reactors in the country.

They accused the Government of casting away the basic tenets of participatory democracy in keeping the academic scientists and elected representatives off the information on nuclear planes and indulging in large scale 'disinformation".

Access

We strongly recommend our readers to read Arjun Makhijani's article "Low Level Radiation and Cancer" which appeared in the October 31st, 1987 issue of *Economic and Politick Weekly.* A recently published BARC study by K.S.V. Nambi and S. D. Soman on the relationship between radiation levels and health status in 5 cities in India tried to indicate that higher radiation levels correlate with lower incidence of cancer. Makhijani finds that not only is the data used in the study deficient, but the analysis is faulty and important contributory factors entirely ignored. He calls this paper "a shameful piece "of work presented in the guise of science," which not only discredits the authors but alto BARC (Bhabha Atomic Research Centre) and the referees and the publishers of the Journal Health *Physics.*

Radiating Complacency

The International Commision on Radiological Protection (ICRP) is a panel of experts born out of a gathering of radiologists in 1928 at Stockholm. Supposedly watchdog of public health, they have over the years zealously guarded the interest of the 'experts' (nuclear industry in particular). Below we reprint 3 articles from two magazines which have in the past taken a generally pronuclear stand.

The limits set for exposure to radiation
are far too lax

The experts on radiation have got it hazardously wrong. ICRP used to believe that there was a safe level of radiation exposure. Then, in the 1660s, it admitted that the risks of radiation simply increase with the dose received; there is no level of exposure below which radiation is complerely safe and above which it becomes nasty. The commission said then that the change in risk should be treated as smooth, even for small doses. It probably shouldn't be. Some new evidence suggests that risk may even rise faster at low levels of radiation than at higher ones.

For practical purposes a safety line has to be drawn. The ICRP, which is meeting at Come in Italy, is suppased to chalk in that demarcation line. The present line is drawn at 50 milli Sieverts (mSv) a year for those subjected to radiation at work; for members of the public it is five mSv a year, with a recommenda tion that their average over a lifetime should not exceed one mSv a year. So a worker getting the full 50 mSv a year will in 1½ years suffer the full dose an ordinary person is supposed to be permitted in his lifetime And the permitted limits themselves suddenly look too high for the public, and far too high for the workplace.

The commission is concerned mainly with two things. One is a measure of the link between radiation dose and cancer risk; the other is a criterion of acceptable risk. The "safe limit" is the dose that carries the highest acceptable risk of cancer, The latest ICRP risk estimate (set in 1977) states that if im people each receive a dose of 50 mSv over a year, 625 of them Will eventually die from radiation-induced cancer. So a person who has a year's worth of radiation at the workplace limit faces a risk of death of one in 1,600. Over a working life of just under 40 years, those annual risks add up to a chance of death by radiation-induced cancer of around two in TOO.

Many people now think the risks arc much greater. In 1980 a joint sub-committe of America's National Academy of Sciences and the National Institutes of Health gave a higher risk estimate: between 790 and 2,500 deaths per im per 50 mSv per year. Recent studies of the survivors of the Little Boy and Fat Man atomic-bomb attacks on Japan also suggest that the relation between dose and cancer has been underestimated. More than 800 scientists and doctors have sent the ICRP a petition calling for an immediate reduction of present permitted limits by four-fifths.

It is not surprising that experts differ. They always do. The flaw in the present system is that the particular group of experts that set the international guideline has persistently shown a bias towards complacency. The ICRP played no partin the campaign to stop the tests of nuclear weapons in the atmosphere—tests which, according to some estimates, could by the end of this century have caused up to 3m people to die prematurely. It withdrew its support from the rule which limited x-rays of women to ten days after the start of their periods in order to avoid irradiating a very young embryo. Although nobody is sure that x-irradiation at Such an early stage is harmful, the damage done by x-rays later in pregnancy is proven. The commission is open to the charge that it puts the convenience of radiologists above all.

To deserve public confidence, the ICRP needs either to cut the present limits on exposure to radiation 6r provide a convicing answer to its critics. Widening its membership to include representatives of the public and workers who are exposed to radiation would help.

Source : The Economist (12. 9. '87)

The legacy of the A-bombs

The survivors of the atomic-bomb explosions in Japan are one of the main sources of information about the effects of low-level radiation. Their response to closes of radiation —including quite small ones—has been carefully monitored since the 1950s and is used to work out the likelihood of harm for various levels of exposure. Any reassessment of the Hiroshima and Nagasaki data has an effect on risk estimates in the nuclear industry and in medicine.

Such a reassessment is now underway and many of the results have recently been presented by Professor Edward Radlford, an epidemiologist at the University of Pittsburgh in Pennsylvania. One of the main problems with the data is knowing what doses were received by the survivors. Little Boy and Fat Man, the bombs dropped on Hiroshima and Nagasaki respectively, were, after all, the first of their kind. The radiation characteristics of Fat Man, a a bomb that used plutonium, were well enough understood for dose figures for various distances from ground zero (the point on the ground directly' below the explosion) to be calculated. Little Boy was a different sort of bomb, using uranium. For some time it had been thought that the two explosions were different, in that Little Boy gave out more of its radiation in the form of fast neutrons than did Fat Man. Now it appears that the harm done by neutrons was about the same in each of the explosions.

This has two main implications. One is that more of the cancers found in the population of Hiroshima than were previously thought were caused by electro-magnetic radiation (that is, gamma rays and x-rays which are more common in everyday-life than are fast neutrons). The other is that the statistics on cancer rates among both Hiroshima and Nagasaki survivors can be pooled, allowing more reliable measurements of the relation between radiation dose and cancer.

'the dosage levels received by the victims of Hiroshima are also being recaculated. New evalutions of the shielding provided by moisture in the air—it was a hot, muggy day-have almost halved the estimates of radiation dosage received. The incidence of cancer may have been underestimated, too. Some forms of cancer can sometimes be overlooked. They turn up more often in careful autopsies than on routine douth certificites. Among the cancers that appear to have been underestimated on Japanese death certificates arc those of the lung, liver, pancreas, prostate and urinary tract. This has made it hard to derive figures about the relative susceptiblity of various body tissues to radiation-induced cancer. For example, if figures from death certificates are used, no significant relation between prostate cancer and radiation dose is found. If figures from the special tumour registries in the two cities are used (these are more accurate and also include non-fatal cancers) a relation between cancer and radiation is found.

Another reason that estimates have been low is that the survey, unfortunately, is not yet finished. The cancer rate in the two cities is still above average. Most distressingly, the Cancer rate for people who were under ten in 1945 is very high, eight times higher than that for those who were over 35. This provides an illustration of the way that sensitivity to radiation depends on age, and shows that children are particularly at risk.

Another fact to be considered when looking for lessons from the bombings is the general health of the sample population of survivors which, five years after the bombing, was better than normal, insofar as their death rate was below average. As well as radiation, they had survived fire, blast, exposure, hunger and extreme grief and stress. A large number who survived the immedate effects of the bombing had soon died of a variety of common diseases; many died who might otherwise have developed cancer. Thus the five-year survivors were a rigourously selected group, not a typical population. Some scientists suggest that more accurate figures may eventually come from studies of the 135,000 people who were evacuated from the Chernobyl area.

That evidence will take many years to arrive, until then, the survivors of Little Boy and Fat Man will continue to dominate thinking about the effects of low-level ionising radiation. Professor Radford argues that this evidence, as it now stands, clearly shows that the risk estimates sanctioned by the International Commission on Radiological Protection are too low by a factor of as much as ten.

Source : The Economist (12. 9. '87)

Rethink on radiation dose limits in Britain

The British government is likely to amend its present radiation dose limits following advice from National Radiological Protection

Hoard based on information from a preliminary reassesment of fatal cancers in the surivors of Atomic bombs.

In September ICRP concluded that the results of the Japanese study raised the risk estimate for the exposed population approximately twofold. The ICRP decided against immediately recommending a change in dose limits and will not issue new advice till it has completed a review, likely to take at least two years. NRPB is recommending an annual dose limit of 15 mSv for radiation workers and 0.5 mSv for members of the public. (The present limits arc 50 mSv and r mSv respectively.)

Revaluation of the Japanese data means that the risk associated with continuous exposure at the occupational dose limit of 50 mSv per year has increased from 1 in 2000 per year to about 1 in 700 per year : a level of risk that "verges on the unacceptable" according to Roger Clarke NRPB's director.

Source : Nature 330, 304, (26.IT.'87)

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The only Source

A. common refrain in the sales pitch of nuclear advocates is that nuclear energy, whatever its problems today, is the only energy source capable of meeting future needs. Dr. Raja Ramanna, the earstwhile Chairman of the Department of Atomic Energy (DAE), made this claim a number of times. In his words, "Nuclear power is the only option for meeting the future needs of power in the country. We in India must not miss this new industrial revolution; for if we do we are bound to lead ourselves to total economic disaster." Sales people are notorious for their zeal. They skip over the 'small print'. Consumers on the other hand, need to be cautious and pay special attention to the small print, or else they risk being taken for a ride.

Before we get into the argument regarding the innocuous-looking "only" one point needs to be clarified. People do not need energy perse : They need energy to accomplish certain tasks e.g. lighting, cooking transportation, manufacturing etc. Electricity is well suited for certain applications and not so well suited for others. In any case, only about one sixth of the country's total energy needs are met by electricity at present. Nuclear power can deliver energy only in the form of electricity. Thus it is clear that nuclear power can never be the answer to *al]* our energy needs. However, let us examine a much narrower claim : can nuclear power totally satisfy at least our eleccricity needs of the future?

What is the situation with regard to electricity consumption today? Barely 2% of the electricity consumed in the country today comes from nuclear reactors. The rest 98% comes from coal (75%) and hydroelectric (33%) plants. Thus, coal and hydel power arc well established and proven technologies. New ways of producing electricity based on the sun, wind and bromass make a negligible contribution at present.

The first contention of the pro nuclear argument is that after, twenty years of almost 'heroic effort nuclear technology has attained the status of a mature technology. "Nuclear energy has been established as an economically viable, competitive source of power." This bold statement often loses its strength in all the moaning about teething troubles which are invoked to explain away the poor performance of our nuclear units. However, for the sake of argument we shall assume here nuclear technology to be fully mature with all the teeth (including wisdom ?) fully revealed,

A change from a mere 2% contribution today to an overwhelmingly dominant role in the future would indeed be revolutionary. The nucleocrats justify this proposed change on the grounds that non-nuclear sources suffer from short comings that prevent their continued expansion. These short comings arc of two types *

1) Limited potential and an uneven geographical distribution : Thus, although only 17% of the total estimated hydel potential of 75000 MW has been tapped till now, expansion beyond 40000 MW is considered unpractical since most of the hydel power sources are concentrated in the Himalayas, far from the consuming centers, and transmission losses pose a great constraint. Similarly, although the country has large coal deposits (enough to last a thousand years at present rates of consumption) a greatly expanded programme of electricity generation based on coal could lead to depletion of the source in just a hundred years Again, most of the coal deposits are concentrated in the eastern region

11) Environmental hazards Large dams cause extensive damage to ecosystems m then vicinity and change the health, productivity and ecological balance of downstream areas coal is difficult to mine, handle and transport and its burning produces a heavy burden of wastes and pollutants.'

Curiously,' nuclear power does not stand up too well either under an examination applying the very same cuteria that are used by pronucler people to reject coal and hydro electricity. The environmental hazards of nuclear power shall be a constant refram in *Anumukti* and we pass over them now without elaboration Since only a relatively small amount of nuclear fuel (compared to coal) is needed in a nuclear reactor, at first glance it seems as if a reactor can be set up anywhere thus reducing the adverse effects of uneven geographical distribution of other power sources In practice, the requirement nearby of a large body of water (sea, lakes etc) for cooling and big enough electricity distribution grid severely restrict the choice of site. Nuclear power requires a very large infrastructure and as time goes on the availability of this infrastructure begins to act. as a magnet for future nuclear growth. Thus, the trend worldwide has been towards clustering rather than dispersal of nuclear reactors. This clustering is sought to be justified on safety considerations since the transport of spent fuel is specially hazardous. For whatever reasons the fact remains that given time nuclear power plants start showing the same uneven geographical distribution as large hydroelectric plants.

The constraint on expansion arising from limited availability of raw materials, applies far more crucially to nuclear power than coal since uranium deposits in the county are far more scarce than coal. If DAEs current plan of generating 10000 MW does become a reality, the uranium deposits will be exhausted in a mere 30 years. Thus, on all counts, whether of limited expansion potential, geographical maldistribution or of environmental degradation, all the "mature" technologies suffer from equally serious short comings.

At this stage of the argument the nuclear advocates bring out the joker from the pack. Although, they say, the uranium supplies are just enough to sustain generation of 10,000 MW for 30 years, during this period such a programme would result in the production of 3200 kg. of plutonium every year. This plutonium after reprocessing would enable the setting up of one 1000 MW fast breader reactor (FBR) every year. An FBR produces more fuel than it consumes and in a programme based on FBR's even the country's present uranium supplies can sustain a much larger (a 250,000 MW) electricity generation. Besides there are vast quantities of Thorium available 111 Kerala, which with the help of plutonitun produced by fastbrecders will allow an even larger programme in the later half of 21st century. With visions of 350,oooMW (i.e., around 350 tunes the present production), one is apt to overlook the fact that the vision depends not on the mature nuclear technology but on a wholly different beast not yet fully recovered from its birthpangs: the fast breeder reactor. The only statement one can make with no fear of contradicton about the fast breeders is that their teething, growing, adolescence, marital, menopausal, senility problems all await us in the future. Only France has built one FBR, on anything like a commercial scale and that reactor has been beset by many problems. The capital costs of FBRs are much larger than the already sky-high costs of thermal (ordinary) nuclear reactors and that by itself makes the electricity produced in breeders at least twice as expensive as that generated in ordinary nuclear reactors. The financial disaster they portend is not the only reason to be vary of the fast breeders. They have many unresolved safety problems : for instance, unlike the thermal nuclear reactors, FBRs can explode like nuclear bombs. But even if all the safety problems are satisfactorily resolved, au unlikely eventuality as Chernobyl and other disasters teach us, FBRs still pose a very serious threat to society. Defending the weapons grade plutonium they produce in large quantities, from theft, sabotage and terrorist attacks would be a horrendous safety problem requiring imposition of police-state measures.

What do the pronuclear people have to say about the potential of the newly emerging electricity generation technologies based on renewable resources ? One of the most attractive characteristics of sources like the Sun, wind, small hydroplants and biological wastes is their wide-spread geographical distribution and the very short time it takes to put up a generating unit. These sources are nobodys monopoly and lend themselves rather easily with very little environmental disruption to small scale electricity generation to meet local (village-level) needs. Their costs too have rapidly come down in just the last decade because a Utile more money has been invested in their research Thus, they arc ideally suited to meet the future electricity as well as other primary energy suited to meet the future electricity as well as other primary energy needs of Bharat. unfortunately, the very diffuscness of these sources is an anathema to the nucleocrats their whole thinking is geared to a few large units producing hundreds to thousands of Megawatts, with everybody in the country tethered to a grid and they themselves in control. Such a large format power distribution system, incidentally, has its own disadvantages universally. But particularly iu India, which has experienced three wars in three decades, and where the best of technologies are put paid to by inadequate maintainance, smaller generating uinits with some surplus capacity for needs of neighbouring areas, seem the ideal solution. The nucleocrats consider all such technologies only in terms of their Potential for bulk production and reject small scale units on the following counts :

i) They arc as yet unproven
ii) They are as yet uneconomic
iii) In the bulk production mode , they too cause environmental problems due to excessive land use, etc.

There arc both sensible and silly ways of producing clectricity. Ways which arc in harmony with both the nature of the source (diffuse/intense) and also with the cultural living patterns of the people who are going to use the energy produced arc sensible; those in disharmony are silly. For example an array of thousands of synchronised mirrors concentrating sunlight on a huge tank of water to produce steam, is as silly a way to boil water as a nuclear reactor. For one thing, it suffers from the same high capital intensity, long construction times, inflexibility and similar other problems that beset nuclear energy. The point to note is that even these admittedly silly ways are cheaper, certainly more 'proven' and ultimately less threatenig than the fast breeder. That this is not a mere pipe-dream can also be easily proven. In California alone, for instance nearly 10000 MW of new electricity generation capacity based on renewables has come up in the last six years.

Indeed the answer to the question of just what electricity source would meet our future energy needs would depend on the kind of society we want to build. A society of conspicous consumption and conspicuors waste in which all production is centralised, in which the demands of bulk consumers get preference over the small needs of the masses, in which a handful of people control the destinies of many, which has a large paramilitary and military apparatus safeguarding the security of the state, whose nuclear arsenals arc a constant threat to its neighbours...such a society may feel the need to pursue the nuclear path. But for a just and equitable society as envisaged by the founding fathers of our nation, nuclear energy is a dead end route, and the quicker we abandon it the better

S. N Gadekar.

Objectivity Meltdown and Obsessive Cynicism

A rather provoking article by Joe Kramer appeared in the March 1987 issue of the magazine of American Journalists, *The Quill.* "The Objectivity Meltdown" was apparently meant to ridicule efforts like *Anumukti's* to provide the public with unbiased information regarding nuclear energy. Once you realize, however, that Kramer is the press spokesman for the Wolf Creeck Nuclear Power Plant in Kansas city Missouri, you will appreciate that the article was written in real earnest.

Kramer admits his bias openly. So the anti-nuclear reader would feel like saying "No wonder!" But the argument turns pretty soon against anti-nuclear attitudes. For Kramer 'discovers' vested interests on the side of the critics of nuclear power :

> Leaders of the anti-nuclear power movement arc inclined to ponray themselves as mankinds saviours.. The antinukes describe themselves sanctimoniously and uisarmingly as consumer advocates, environmentalists, public interest activists, industry critics. But they have no more claim to moral superiority than do the nuclear scientists and industry spokesmen who arc made to look sinister by comparison because they arc on somebody's payroll....

We would do well to remember, though, that not only is this argument old, it is also specious, because there is no essential connection between being paid for work and the nature of anti-nuclear protest. Kramer tries to assign the same questionable motives to the anti-nuclear protester as those that have been known to activate the supporter of nuclear power. And it is patent now that the supporter of nuclear power as a class refuses to take into account the lasting human considerations (as opposed to commercial or other short-term considerations) regarding consequences of nuclear proliferation. As for professionalism, we wish that antinuclear protesters were more professional than they are now !

As for financial backing and power, a comparison of the production quality of *Anumukti* with that of *Nuclear India* will reveal without doubt all that goes by way of advantage, which the words of Dr. Raja Ramanna, for instnee, enjoy. Such advantages of establishment backing do not restrict themselves to the nuclear concern. And incidentally, could a pro-nuclear estblishment ever afford to keep spokespeople candid in criticism of short-comings and dangers inherent in the nuclear idea and nuclear technology? Witness also the expensive powerhouse of administrative, legal and para-military and military support which governments committed to nuclear energy have had to call upon all the time. Whatever can be these attractive carrots that tempt the anti-nuclear workers, we wonder, for kramer says,

> Anyone who works professonally against nuclear power is getting a paycheck just as surely as is the person who works to gain acceptance for nuclear power.(-p.15)

We notice, by and bye, that Kramer becomes more direct. Behind the activities of "the anti-nuke gurus" he discovers hidden agendas with the help of which they deceive and misuse "their fearful followers". Some of them even, he says, have "fairly radical goals". Well, the avowed agendas on both sides, pro and anti nuclear power, are quite obvious. Undeniably, too, some on both sides may possess questionable motives; such motives arc hardly an anti-nuclear monopoly! To eradicate doubt in the minds of readers of Anumukti, all the same, we state in plain terms our motive and agenda (that is, if the title leaves them in any doubt) : liberation from a nuclear policy which implies a centralisation of nuclear power (in terms of its political ant! economic power), neglect of the interests of the majority of the population for the benefit of a few, disregard for human and environmental health within and outside the country. Admittedly, these thoughts are bound to appear radical to those staring at illusions of a nuclear paradise in the 21st century.

Having thus cleared *Anumukti,* we hope, of the bias of "the antinuclear power people and their misleading views," let us proceed to the way Kramer discredits the journalists reporting about nuclear accidents. Kramer, who himself had been a newsman for long years, is concerned about the missing professionalism, i.e., objevtivity, of his former colleagues : they "glamourize" the anti-nuclear movement, because this serves to make their stories sensational; they rely on anti-nudbar. informstion in a disproportionate way and this reliance results in an "all-too-obvious anti-nuclear tilt" in the media. They do not just report what *has* happened, but they have gone *so* far as to stress the "what-ifs".

In a letter-to-the-editor appearing in the May number of *The Quill*, the journalist Timothy Lange from the *Los Angeles Herald Examiner* explains how what Kramer calls his "obsessive cynicism on the nuclear power issue" developed :

> ..after a few years of catching spokespeople for the industry and the Atomic Energy Commision in repeated distortions and outfight lies, I began to question the bright-new-tomorrow press releases I had once swallowed so eagerly.

Is this "healthy scepticism, the hallmark of American journalism",which Kramer misses in the reporting of the media on the Three Mile Island and Chernobyl accidents, wrong if it slowly discovers the unholy alliance between governments and nuclear industry ?

> Timothy Lange : "My scepticism turned cynical arter I became better acquainted with the frightfully scandalous history of the nuclear industry and the relevant federal bureaucracies without which commercial atomic power would never have been developed."

Tom Gardner, writing for the Union of Concerned Scientists, which has been severely criticised by Kramer for its anti-nuclear position, underlines Lange's argument and shoots back :

> Kramer is off base in suggesting, with no evidence, that media coverage of nuclear energy exhibits an intentional bias against nuclear power.. 'Kramer's article is a good example of why experienced journalists don't just wrap up their stories and send them to their editor after talking to the local utility spokesman (p 10/11). (In the US electricity is supplied by private utility companies.)

In the *St. Louis Post-Dispatch.* Patricia Tummons, defends a critical approach to the nuclear issue by noting that :

> Responsible repotting on any undertaking that has potentially devasting consequinces for the environment must address this issue.

i.e., even profession al journalists have to go beyond just describing the disasters that had happened so far. They have to warn as well.

What does the other side say ? Here is Dyek Smyser, of *The Oak Ridger,* Tennessee, who characterises himself "as a newspaper editor for nearly 40 years in' a community whose reason for being is nuclear technology, as a personal friend and neighbour to hundreds of persons involved with that technology".

Smyser, who has "felt the same frustration that Kramer has", also observes that the media have resorted far too, often to discusions of *the "what-ifs"and he explains this situation* by the *fact* that no "what-as" i.e, objetive statements of nuclear catastrophies, was available. With Chernobyl the situation has changed

> To the extent that Chernobyl furnished facts rattier than speculation about the causes and effects of a nuclear power plant disaster, it could contribute significantly to a more accurate public conception of nuclear power,

While the surprised reader of this letter still wonders what the victims of the Chernobyl disaster and the consecutive dislocation would think about this statement, Smyser criticise? the anti-nuclear "mind-sets" of the media :

> . .has any other mind-sot about a scientific and technological question been so at odds with the great majority of experts in the field as is the anti-nuclear power mind-set ? Alvin M. Weinberg, former director of Oak Ridge National Laboratory and perhaps most reascned pre - nuclear scientist in the country, feats that this antinuclear power mind set is about to fore-close the nuclear power option for the US, at least for the next half century or more

It seems that Smyser overestimates the role and power of the media when in quoting Weinberg, he apparently evokes the spirit which endangers civilisation.—A point which resounds in Smyser's letter is the main topic of several other contributions to the discussion in *The Quill* in the first half of this year. These writers express their concern over a gap in the communication between scientists and journalists. Science, which has gained such an eminent role in our modern world, is given far too little importance in the media. However, media which depend on a consuming public, are able to give science or technology their due place only in the context of spectacular events like accidents in nuclear power plants.

This misinformation results in a phenomenon which Kramer calls the "Hiroshima Syndrome", the disability to distinguish between nuclear power and nuclear arms. Finally, the naive uninformed public gets frightened about anything connected with radiation, says Kramer. Considering the natural radiation which we arc exposed to, we should remain calm about such low doses of additional radiation as arc due to nuclear power plants. As the crown witness he quotes Dr. Robert Gale, the American bone-marrow expert who had rushed to USSR after the Chernobyl disaster in order to help Russian doctors *there :*

> The long term consequences. .would be less than those expected from the burning of coal to generate electricity.

What this comparison means in actual terms, Dr. Gale explained at another place, (here quoted from *Atom,* the journal of the British nuclear stablishment) :

> in the USSR about 20,000 deaths might occur in the next 50 years because of Chernobyl. The replacement of nuclear by fossil fue would result in approximately, one million deaths in this period, if one Chernobyl-type accident is assumed.

Yet, Dr. Gale's statements and activities have been too contradictory not to be regarded with a lot of caution. But Kramer goes even further than Gale, stating the near to-absolute safety of nuclear energy :

> The consensus of most radiologists and radiation biologists is that the increase in long-term cancer deaths as a result of radiation from the Chernobyl acident will be of such a low order of magnitude that it v ill be difficult if not impossible to detect statstically

And such words from the pen of a man who just has reproached the press of being cynical ! A similar thought-lessncss-or is this intended ?—appears in the letter of Bertram Wolfe, President of the American Nuclear Society, who argues, that Chernobyl cannot happen in the U.S.(on specific technical reasons). He says:

> In a sense the Chernobyl accident is an affirmation of the more careful and expensive approach to factor safety in the US ___

This sentence, in a way, echoes Du. Ramanna's words :

> After the Chernobyl accident, I must say that most of our newspapers have taken the accident in the proper perspective i.e. to consider as *a* part of the learning process of the world. Future reactors will surely operate more safely under any circumstances as time goes on..

It seems that a long time before Kramer discovered the "objectivity meltdown", as he calls his article, the virus of cynicism has caught hold on a nuclear establishment which, after failures in the technical and economic fields, has suddenly become vulnerable to public criticism.

We should like to suggest,inost humbly of course, that the foundations of the pro-nuclear establishment have been shaken by the major disaster of Chernobyl. (It could, but naturally, be immensely more disastrous if such an accident were to occur in an otherwise technologically backward country such as India or Pakistan.) We may hear, in the voices of the Kramers of the nuclear establishment the high notes of an anxiety no longer deniable after Chernobyl. The anti-nuclear protesters did not *need* the Chernobyl disaster for their warnings ("what ifs"). The pro-nuclear establishment can only lose ground heavily with such an incontrovertible disaster. Try what they might, they can only resort to sarcastic rhetoric against anti-nuclear protests. And if the issues were less fundamental, we might feel satisfaction in the strident tones of Kramer. Our concern is so creat, however, that we cannot rest contented at this sign of panic,

Sources : Joe Kramer "The objectivity meltdown", in : *The QUILL, MARCH* 1987, vol. 75/3, p.12-17. Tom Gardner. "Take the pro-nuke argument with many grains of salt", in : *The Quit.,* April 1987, vo. 75/4y p. 10-11, Letters to the editor *in* : *The Quill* vol. 75/4-5. Raja Ramanna. ',The nuclear power is the safest and most economic form of producing electricity", excerpts from a speach held in Bangalore on 10 Sept. 1986. Note on Chernobyl in *Atom,* August 1987, No. 370, p. 31.

JOIN

ANUMUKTI

A JOURNAL DEVOTED TO NON NUCLEAR INDIA

WITH SUBSCRIPTIONS, CONTRIBUTIONS AND DONATIONS

NUCLEAR SELLING CAMPAIGN

The newly-constituted Nuclear Power Corporation has drawn up a 15-ycar plan to generate 10,500 MW that is, a tenfold increase of current capacity, and is envisaging an investment of Rs. 10,000 crore. The NPC has an authorised capital of Rs. 2,000 crore and will be in charge of the design, construction and running of nuclear power plants.

According to the chairman, the setting up of the corporation will facilitate, it to achieve two objectives : ensuring high operational efficiency of the power units and the completion of new projects expeditiously. In other words, the setting up of a corporation is a big step towards achieving the 21st century nuclear Utopia.

It may well be that the corporation will indeed have a greater degree of flexibility than had the Nuclear Power Board, its predecessor which was merely a component of the department of atomic energy. But it is highly unlikely that in a sensitive area like nuclear power the corporation will have any real degree of autonomy in decision-making. Moreover, the inefficiency apparent in the planning and construction or the functioning of nuclear plants is hardly because the NPB has been hamstrung in making vital decisions. Similarly, unless the corporation is structurally reorganised thoroughly, project management or construction efficiency is not going to be streamlined. And this, given its mammoth size and the need ro centralise most of the authority, is not a probability. Quite clearly the constitution of a corporation is mainly for the purpose of being able to tap public funds. Of the investment planned, 37 per cent is to be generated from its internal resources, 30 per cent from government loans or equity and the rest is to be met through market borrowing. The corporation will issue, public bonds—by the end of December 1987-to raise a capital of Rs. 100 crore.

It is with the bond issuec in mind that the chairman has urged the NPC to 'educate' the public about the plants, their operation and their impact on the environment. He has suggested that people living around these projects should be told about what is going on within the plants. Does this mean that the nuclear establishment is, at long last, prepared to divulge information regarding the status of the nuclear power industry in India ?

If the PR effort which preceded the inauguration of the NPC is any indication, all that this new outlook means is that we will now be subject to an intense and determined disinformation campaign. For it is quite ironical that the chairman should even mention the need to be more open. No corporation which is hoping to raise funds from the public can afford to draw attention to its weaknesses., its inefficiencies and the possible hazards it poses. What is required in the circumstances is a neatly tailored PR campaign to 'sell' the idea of nuclear power, which is precisely what we can expect in the months to come. This in turn puts a greater responsibility on those who have reason to be cautious and critical about nuclear power to separate fact from fiction.

Upto now the anti-nuclear groups in the country have been hampered by a dearth of information; now they will have to cope with a barrage of disinformation.

SOURCE : Economic & Political Weekly (7. 11.'87)

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circulation etc. should be addressed to :
Editor Anumukti,
Sarapoorna Kranti Vidyalaya,
Vedchhi, Via Valod,
District: Surat 394 641.
Editor: Surendra Gadekar
Printed at:
Hhargava Bhushan Press, Varanasi.—3/12-87

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol. 1 No. 4 February 1988

> 'That _corpse you planted last year in your garden,_
> _*Has it begun to sprout ? Will it bloom this year ?_
> 'Or _has the sudden frost disturbed its bed_ ?
> 'Oh _keep the dog far hence, that's friend to men,_
> _'Or with its nails he'll dig it up again_
> The Wasteland _T. S. Eliot_

A reader, Shri. R. K. Patil of Nagpur has written in to ask, "Is it possible to dispose radioactive waste in a manner non hazardous to human health ?'' The answer in one word it *NO.* The answer preferred by the nu:lcar establishments is 'not yet' with the stress on yet. Thus the dispute is not about the *fact* that there is no known way of getting rid of the large piles of these hazardous substances. Now can there be much disagreement about the seriousness of the danger posed by these intractable and highly toxic pollutants. The newspapers have *been* full of stories which highlight this aspect—from the Brazilian tragedy where ignorance, exuberance and a mere 100 gnu. of Cesium-137 combined to make pariahs of the one million residents of Goiania to the West Germ in scandal where old fashioned bribery has played havoc with the supposedly 'foolproof full-scope safeguards and one finds hundreds of bombs' worth of plutonium and uranium simply 'missing'. Reports speak of its appearance in Libya and Pakistan—but that is all old hat. In the nuclear age of 'plenty' for everyone, the question is—do the PLO, LTTE, GNLF, XYZ...have the Bomb ?

The only point of controversy then is about the timeframe in which a solution might be found. Nucleocrats usually claim that a solution is just round the corner. With touching faith they assert that technology itself shall solve (as it always has) the problem it has spawned. All they ask for is a little forbearance. Some more time to do mote 'research.'

In a trivial sense the solution to the problem of radioactive wastes has always been known. It is just to wait and do nothing. Radioactivity is the result of energy 'shedding' by unstable nuclei of atoms. Over time these nuclei naturally decay and the activity of given mass decreases. However, since radioactivity is a nuclear property and has nothing to do with the electronic configurations of the atoms (on which chemistry depends) there are no chemical means to speed up the process of radioactive decay. Thus the problem of 'disposal' of radioactive wastes becomes one of how to isolate the waste and keep it from contanianating the environment for the millenia it takes for the man-made radionuclides to naturally decay.

'solution' which just two drendes ago looked very promising now appear dangerous. In face, greater knowledge has made the problem more and not less intractable. Recent developments in applied mathematics seem to suggest that "some forms of environmental unpredictability are intrinsic and hence incurable." The irresistable force of scientific omnipotence has met its irremovable object—dangerous objects which won't stay put.

In the meantime; scientists research, nucleocrats bring out new public relations gimmicks and antinukes protest : while the wastes pile up day by day.

Surendra Gadekar

Anumukti deeply mourns the death of Dr. A. K. Ganguly who was a friend, teacher and a valuable ally to many voluntary environmentalist organisations in the country. A pioneering environmentalist, it was he who established the discipline of Health Physics in India. The courage he displayed in refusing to compromise his rigourous stand on safety no matter what the pressures, whether political as in the case of Narora, or from peers as in the case of radiation exposures at Tarapur was indeed exemplary.

LETTER BOX

Anumukti, I assume is addressed not only to a small circle of experts or those who have been interested in the topic for a long thru. Therefore it would be important to have an introduction to technical terms at least in one issue of the journal. An introduction to the scientific and technical background of the subject would help newcomers to understand the subject matter. With such a basis a wider cirle of readers could be addressed. Secondly, informartion about and analysis of the connection between nuclear energy and nuclear arms is important. In addition to this a discission of the alternatives is absolutely neccesary. Reports about activities concerning solar, wind or hydro-energy should be included in the journal as a constuctive criticism of atomic energy.

Markus Schuetterle
Matara, Sri Lanka

It was a welcome surprise coming across the article "Save the Western Ghats—March" in Anuraukti vol t no 3. With succeeding Indian Governments accelarating our suicidal take for technological parity with so called 'developed' nations, the quality of human life now and in the future stands threatended from various angles. Nuclear power is just one of these, and if a movement against it does not interrelate with other similar movements, a united forum of protest cannot be forged.

Another sad fact is that the lack of a proper communication system enables the people in power to proceed in blithe disregard of public interest and public opinion fails to get properly mobilized. Movements like 'Chipko' stand out as beacons of encouragement for other movements. The lesson is that with perseverence, motivation and the involvement of the common people (whom these projects hurt most), the voice of reason can be conveyed loud enough for those in power to take note.

I hope that Anumukti not being a journal only devoted to a non nuclear India, will continue to include similar articles and news-reports of protest movements and help to bridge the communication gap that exists.

Abhijit Das
Varanasi

DEADLY CROP IN THE TANK FARM

The safe storge of radidatire wastes is not a problem of mere academic interest. It effects us all Below we present a shortened summary and some of the conclusions of a no *page report prepared by Dr. Arjun Makhijani, Robert Alvarez and Dr. Brent Blackwelder for the Environmental Policy Institute. The report is based on official documents obtained through requests under the Freedom of Information Act. The report describes the operation of an existing nuclear facility in South Carolina. It contain. many lessons for us in India.*

Eight hundred trillion curies *of* deadly high-level radioactive wastes are stored in the Savannah River Plant (SRP). Although 27 million gallons of these wastes constitute about one third of the total volume of military high-level radioactive wastes in the U.S., they contain about 78 percent of the total radioactivity in all U.S. military high-level wastes. SRP's high-level wastes pose a serious threat to the plant's workers, to the people who live in substantial portions of South Carolina and Georgia, to future generations and to the environment. The rates of radiation-related cancers among workers are already significantly higher than expected. The plant site borders the Savannah River and sits atop the Tuscaloosa aquifer, one of the most prolific and used sources of fresh water in the eastern United States. The 300 square mile site and the shallow aquifers above the Tuscaloosa are so severly contaminated that it is reasonable to conclude that it has been treated by the federal government as a national sacrifice area for the U.S. nuclear weapons program.

The high-level radioactive wastes which continue to build up at the Savannah River Plant result from the production of radionuclides for the U.S. nuclear weapons program. In particular most of the wastes come from the production of plutonium in nuclear reactors and the subsequent reprocessing of the reactor fuel rods in chemical separations plants. The SRP is owned by the *U.S.* Department of Energy (DOE) and operated under contract by E.l. du Pont de Nemours and Company (DuPont). Most of the major equipment - such as the reactors and reprocessing punts, as well as many of the tanks, date back to the 1950s. This is a field in which technological change and safety standards have changed rapidly. Yet in recent years the basic approach to watte management at the Savannah River Plant Tank Farm has changed but little. In fact. the operating record of the obsolete facility shows that its very design basis was faulty and dangerous.

There is also substantial evidence that these problems have been compounded by unsatisfactory management in many areas crucial to safety. Both Dupont and DOE appear to be more anxious to minimize any adverse consequences and thus allay public fears than to address operating problems and risks from accidents in a scientific and technically responsible manner.

We summarize the issuse under the following four headings :

o Routine Environmental Contamination
o Accidents and Risks
o Worker Exposures and Cancer Risks
o Long-Term Management

Routine Environmental Contamination

The design of the Savannah River Plant assumed that radioactive wastes could be routinely discharged into the soil because the soil would trap them and prevent them from contaminating water supplies, particularly in the case of some of the more deadly materials like plutonium and ccsium-137. Little thought appears to have been given to pollutants from non-radioactive toxic materials and less to interactions between the two kinds of pollution.

Time has shown both the design premise and the omissions to be serious errors. Radioactive materials and non-radioactive toxics have contaminated the shallow aquifers beneath SRP. Interaction between solvents and plutonium has caused it to migrate into the groundwater in twenty years-compared to a predicted time of hundreds of thousands of years. Despite repeated internal and external efforts to stop these dangerous and technically obsolete and erroneous practices, Du Pont and DOE continue routine discharges of toxic materials into the soil.

lf tho SRP site is not to become a permanent national sacrifice area, a massive clean-up of the site will be required. DOE has estimated that the first seepage basin cleanup would require a billion dollars. The problem of clean-up is bound to be severely complicated by a lack of data and unreliability of such data as there is.

We have two widely differing estimates for plutonium in the high-level waste tanks. Data in DuPont Safety Analysis Report (issued in 1978) yields, an estimate of about 170 Kilograms of plutonium containing 300,000 curies of radioactivity, for 1980. However, in 1980 DuPont supplied an estimate of 1 million curies of plutoium - about 400 Kilograms - to the National Academy *of* Sciences. This enormous discrepancy, serious both for plutonium accounting from the security point of view, and for its potential environmental consequences, is unexplained.

Accidents and Risks

Some of the most technically difficult aspects of waste management at SRP have to do with the problems associated with accidents and risks to the public and to future generations.

Consider, for example, the question of hydrogen build-up in the high-level waste tanks due to the action of radiation on hydrogen-containing chemical compounds in the waste. A build-up of hydrogen to high enough levels, due to partial or total failure of tank ventilation systems for example, could cause an explosion severe enough to destroy the tank and send millions of curies of radioactive waste spewing into the air and onto the land. Such an accident could cause up to 20.000 cancer cases in addition to genetic damage and other ill-health effects. In addition, a very large area of land would have to be written off essentially for ever. It would also have unpredictable repercussions, possibly very severe, for groundwater contamination.

The DOE and DuPont approach to such accidents irresponsibly assumes that groundwater contamination can be ignored as "insignificant" because the soil will retain the radioactive wastes. This assumption has been shown to be invalid by SRP's own operating experience and has been criticized by the U.S Geological Survey, DOE and DuFont-also-assume that water me patterns and many other. factors will not change significantly *fat* a hundred years or more. This is not merely arbitrary, It is contrary to evidence. Water use patterns have changed immensely in the past few decades with DOE and irrigation being major contributors to that change. Indeed, in other reports, DOE plans on continuing to contribute to signifiant increases in water use.

SRP was not designed to withstand severe earthquakes. In the last few years, howcvcr,both the U.S. Geological Survey and the Nuclear Regulatory Commission have concluded that severec earthquakes, comparable to the one in Mexico City in 1985, cannot be ruled out. The Nuclear Regulatory Commission has criticized the SRP assumptions of moderate earthquakes at most, to "contain a strong element of speculation." A severe earthquake could cause millions of curies of radioactive wastes to contaminate the air, soil, and water of the area. Even using the non-conservative assumptions of DuPont and DOE, it would cause from IT,OOO to 230,000 excess cancers and up to 2,500 genetic defects in future generations. The direct cost, moderately estimated, would be from 5800 million to $14 billion-excluding the cost arising from writing off of large areas of land, from contamination of water supplies, from property, agricultural, and business losses.

Current law specifies maximum DOE liability as $500 million. DuPont is exempt from liability to the public in the event of accidents, earthquakes, and other catastrophic events. It exempts contractors from liabilities arising even from their own negligence.

Worker Exposures and Cancer Risks

Workers at SRP receive considerable doses of radiation just by being on the site because of routine emissions and radiation from site contamination. These doses averaged about 150% more than the doses received off-site from background sources. In addition, various types of work involve additional exposures.

The external radiation doses to SRP workers alone can be expected to cause between *16* and 330 excess cancers among SRP workers, with more than half of these expected among, waste and reprocessing area workers. Already there are definite indications at SRP and at other DOE owned nuclear facilities around the country that workers are contracting and dying from radiation related cancers. Some examples :

- o At SRP, the incidence of myloid leukemia has been more than double the expected number (6 occurred versus less than 3 expected.) :
- o At the DOE owned Oak Ridge Gaseous Diffusion Plant, a study found "excess deaths due to lung and brain cancers and respiratory disease..."
- o A study of 2,509 DOE workers exposed to more than 5 rems between 1947 and 1978 showed a rate of cancer of the rectum at three times the national average among them.

The emergence of an alarming pattern of excess cancers has elicited a curious response from DuPont. An internal 1976 study by DuPont found "evidence...that lung cancer and leukemia were significantly increased..." among workers. Instead of publishing the study, DuPont attempted to erase the significance of its findings through statistical manipulations. Even an adisory committee to DOE found these manipulations "inappropriate," and recommended that the data be reanalyzed by a non-DOE/DuPont group.

The data themselves are not in good shape. One of the principal sources of data-the computerized Data Bank for accidents and non-routine maintenance is missing thousands to tens of thousands of entries. Moreover, there is very little data on interal radiation exposure-through inhalation, ingestion and wounds. Most of the reported data is gathered by obsolete and discredited methods. This is a crucial area for evaluation of safety practices, and liability, since internal exposures are emerging as a principal cause of radiation related cancers. The records of DOE are particularly poor in this regard,

Long-Term Problems

Little attention was paid to the problem of long-term waste management when the plant was designed. In the early years, it was simply assumed, without significant geologic or other systematic scientific investigation, that the wastes could be safely pumped into the bedrock underneath the plant site, and below the much used Tuscaloosa aquifer. Pending such long term disposal, it was decided to store the wastes in carbon-steel tanks which were much cheaper than stainless steel tanks. However , this required the neutralization of the highly acidic wastes discharged from the SRP reprocessing plants, so that the acid would not corrode the carbon-steel. This created a much larger volume of waste, including sludge which is difficult to handle.

Eight of the first sixteen tanks developed leaks in the primary containment in about a decade. This has required much more handling and moving of the wastes than planned - which in turn causes more equipment and process problems, worker exposures and environmental contamination.

The plan to dispose of the wastes into the bedrock under the plant has been abandoned in favor of solidifying the wastes by encapsulating them in glass. Solidification of the liquid wastes is urgently needed.

However, the current glassification plans, which arc being implemented, also face some serious problems.

The operating record does not bode well for the proposed waste vitrification facility at SRP called the Defense Waste Processing Facility. This will require much waste movement and remote operation. If heavy maintenance and repair arc required, worker exposures may increase. Further, there is no operating experience even at the pilot plant level for vitrification of radioactive sludge, which has been the source of considerable handling problems. Unanticipated breakdowns or failure of the plant to operate as predicted could result in costly delays in the implementation of long-term waste management, while at the same time-leaving the wastes in the current dangerous liquid form.

DOE also plans to dump very large quantities of "low level" wastes, solidified in concrete, as part of its program. This will increase the radioactivity in the low-level burial grounds many fold. It almost certainly will contaminate the groundwater with very much larger quantities of radionuclides than are already present.
In particular, it will increase plutonium-238 contamination by about 100 *times,* and that by iodine-129 and technicium-99 by *several*

million times over the amounts that have been discharged already as "low-level" wastes into the seepage basins.

Some General Recommendations

- o The Department of Energy should not be allowed to continue to regulate itself or its contractors.
- o Current legal limits on DOE liabilities should be lifted. Further, DOE contractors should be held financially accountable for major accidents stemming from their negligence. Both would be great incentives for safety.
- o Independent studies on various aspects of the plant such as health and safety, decommissioning and long-term disposition of the site should be initiated. All documents relating to these matters should be made public.
- o The Savannah River Plant should be barred from producing any more high-level liquid radioactive waste until the long-term questions are satisfactorily resolved.

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Nuclear Seas

There are approximately 900 nuclear reactors in the world, with 374 in operation on land and over 500 at sea, powering USA, UK, French Soviet Chinese, and now Indian vessels. Reactors at sea operate without any regulations covering radioactive discharges or accident reporting. They are a continuous, moving source of radioactive pollution, and frequently break international law by travelling submerged within territorial waters of other countries.

The 500+ reactors at sea frequently operate in hazardous conditions and have regularly run aground, sunk, suffered fires, floods, mechanical breakdowns, and have collided with fishing boats, tankers and other warships. In the past ten years there have been over 200 accidents with Soviet subs alone, including the sinking of 3 subs complete with reactors and warheads. Two US subs have also sunk, and between 1965 and 1985 the US navy has had 628 "incidents" and two "accidents" involving nuclear weapons. It is impossible to calculate the risk of a major nuclear accident at sea because of the secrecy surrounding their operation and records.

Ireland is in the frontline of much nuclear activity with the Irish sea containig up to 15% of the US nuclear arsenal at any time and Warsaw Pact vessels on surveillance at either end. Both NATO and Warsaw Pact nuclear submarines travel underwater within Ireland's three mile limit, staying within the warm coastal waters to avoid infra-red detection by satellite. Nuclear subs can also carry up to 160 nuclear warheads. Thus these vessels not only pose a threat in themselves but they arc also a target in the event of war and have the capacity to initiate a nuclear war.

Since the oceans are an essential part of life and provide protein for much of the world's population, it is imperative that the non-nuclear communities of the world unite against the continuation of the unacceptable contamination and threat to the seas. Earth watch, Irish CND, and Greenpeace-UK have plans to step up the campaign to denuclearise the Irish Sea, as part of the recently launched Greenpeace International campaign to Disarm the Seas.

Editors Note : This ought to be read in conjunction with newsreports about India's acquisition on lease of a Soviet nuclear powered submarine which would give the Indian Navy 'deep strike' capability. Those newsreports should be read together with other newsreports about India's sudden 'desire' to buy two nuclear power plants from the Russians and giving the go-bye to the much flaunted self reliance in the nuclear field.

Nevada Wins the Booby Prize

Thirty years of debate and uncertainty have been brought to an abrupt end by a sudden decision by the U.S. congress to name Yucca Mountain, Nevada as the site of the United States first repository for high level nuclear waste. The decision throws out the scientific site selection process laid out in the 1982 Nuclear Waste Disposal Act.

The 'honour' of being the site of the repository for high level-waste had originally been conferred on an abandoned salt mine in Lyons. The project was, however, cancelled in 1972 after two severe technical problems had become apparent. The area in which the proposed site was to be located was literally riddled with drill holes and cavities from numerous previous mining activities. If all the holes could not be detected and sealed -which was likely- the long term integrity of the site could not be guaranteed. The other discovery was of small pockets of brine in the salt. It was found that brine migrated towards the emplaced source of heat (the simulated waste) and corroded the metal canisters.

The congressional decision was greeted by howls of fury in Nevada. Governer Bryan attacked the decision as a "legislative atrocity" that "blatantly rejects the law of the land" and promised a "nuclear nightmare for the congress." The state will fight in the courts and through "whatever other avenues needed."

The selection process abandoned in the now legislation would have required the preparation of a short-list of *6* sites - 3 each west and cast of Mississippi - and each stable enough to store radioactive waste for 10000 years. A site would then have been chosen first in the west-less population density but far from the waste producing reactor sites thus entailing longer transportation - and some years later in the relatively more crowded east. But the process proved unworkable, despite many years of debate. In May '87 the department of energy tried to take a short cut by announcing three sites in the west (among them Yucca Mountain) and giving up the search for sites in the east. But the resulting uproar from the west quickly lead to demands to restart the whole process. Given the level of opposition everywhere, it became apparent that it might take decades to complete the assesment of even three sites. Earlier this year there was a proposal that a 100 million-a-year incentive be paid to any state willing to open up the first high level nuclear waste dump. But no state was found mercenary enough to commit suicide.

Now Nevada seems saddled with the dump. The great advantage of Yucca Mountain, a 1500 foot high ridge of volcanic rock, is that it lies well above the water table. A shallow storage area, 1200 feet underground would seem to permit easy access while avoiding possible groundwater leaching of wastes. Yucca Mountain is in a corner of the Nevada nuclear test range and far from human habitation. But state geologists argue that the site lies near an active fault and that a major earthquake or volcanic eruption may split it open. More immediately, the local tourist industry would suffer as visitors start sharing roads with waste bearing trucks. All these fears would have to be addressed in the ensuing site investigation, and if they turn out to be well founded, then the whole process will have to begin again at a new site with a delay of many years.

That site selection is no easy matter is clear from recent tevelations concerning U.S.'s first permanent site for low level waste, near Carlsbad, New Mexico. 700 million dollars have alredy been spent on a vast network of tunnels and storage rooms burrowed 2000 feet into thick salt deposits. Back in 1957. salt deposits were considered as the best repositories since the very pretence of salt indicated that there had been no groundwater incursions. However in just thirty years attitudes have had a sea change and it is now felt that "the area was selected in haste."

Sources : Nature 330, 682 24/31 December 1967
R.Pohl's stricle, "Will at busy Put" ia "Nuclears POWER—Both Sides" by M Kakus and J. Tcainer.

Editor's Note : There is *evidence of continuous human habitation for 10000 years of the Nevada Test Sit*. Nuclear activities the world over seem to have a special attraction for lands of tribals-politicaly the weakest section of society.*

Another Pyrrhic Victory

Pyrrhus, king of Epirus (318-272 B.C.) fought a war with the Romans in 280 B.C. on the bank of Siris at Heraclea and defeated them. But the victory was won at too great a cost. "Another such victory and we are lost", he is supposed to have reflected (Geddie 1966). Problems of nuclear waste disposal have brought us on the threshold of another Pyrrhic victory.

Radioactivity was discovered only in 1896 A.D. but existed prior to its discovery too. Around 1500A.D. miners in Saxony and Bohemia died, after working on pitchblend excavation for about 5-10 years, of what was merely called lung disease. It is now deduced that the concentration of Radon (222) and its radioactive daughter products was at 10 to 20 times what arc now considered safe working levels, and it was the cause of those deaths. (Morgan 1976a). But as radioactivity was then not formally discovered, these deaths could be attributed to ignorance and regretted. Decades after the lethal effects of radioactivity were known, 60 uranium miners died of lung carcinoma because they were required to work at high risk levels. "It needed a unilateral rectitudmous action on the part of one individual in direct opposition to three powerful agencies, which could not be suspected to be innocent, to reduce the maximum permissible exposure level (Morgan 1976a) to a value recommended by the International Commission of Radiological Protection." The death toll and the incidence of radiation-caused cancer have in the meanwhile followed an inexorable but a sad course (Morgan 1976a). The lesson obvioously is that there is a strong nuclear lobby and few deaths would not deter them to deviate from the disastrous direction they have opted for.

It was initially thought that the resiliency of the natural environment to absorb pollutants was large and could be depended upon to dispose the pollutants off. As a result, even in 1943, it was considered reasonable to discharge radioactive waste in the White Oak lake (Morgan 1976a). The policy was that of "dilution and dispersal" (Morgan 1976b). There was pressure to accept occupational tolerance level which was 3.6 x 10^7 times as high as what is now considered accetable, Even when that pressure was not succumbed to, the level was still 36000 times the current recommendations (Morgan 1976a).

The Reality

Some of the radionuclides that can adversely affect health are among others tritium, strontium-90, cesium-137 and the transuranics. Typical halflives are 12 yrs, 30 yrs, 30 yrs and 25,000 yrs for tritium, ccsium-137, strontium-90 and plutonium-239 respectively. That the waste containment should last for 20 half-lives is a widely accepted thumb rule (Karam 1976). This figure would come to 250 yrs, 600 yrs and 500,000 yrs for the four elements above. It is important to note that these periods span a large number of human generations and it is ludicrous for any one to premise responsible and accident proof containment of these dangerous materials. As the total quantitly of nuclear waste to be disposed off increases over years, the thumb rule of containment for 20 half-lives may have to be revised upwards.

The ill effects of the radionuclides include radiation caused cancers and genetic mutations. (Mills 1976). It is well-understood by experts that the damage done is cumulative and irreversible, and the threshold theory is untenable in the light of the experimental evidence. Morgan 1976a) also the sections of society that benefit from the nuclar power and the group that suffers the hazards could be totally different (Peele 1976). Therefore economic cost-benefit analysis is highly improper.

But the issues are normally obfuscated wilfully. The terms such as MPE or MPD (maximum permissible exposure or dose) suggest that below that level, there are 110 risles : at least a layman would thick so. Subjecting unsuspecting population to unwarranted hazards violates the ethical principle of 'informed consent' which the medical profession is supposed to follow. The whole population has now become guinea-pigs in an experiment which hat potentials of endangering life, human and otherwise, on this planet. It has even been suggested that nuclear power is incompatible with indefinite sustenance and perpetuation of life on earth in time (Gofman 1976)

The protagonists of nuclear power tend to be callous in this regard. There is even a case of a scientist, who researched on carcinogenic toxicity of plutonium and voiced concern, being removed from job by a prestigious laboratory (Gofman 1976). Thus there is a deliberate attempt to deemphasize the problems. Secondly, there is a naive belief that safety procedures could take care of the problem. The fact, that human record *of* following any procedure scrupulously over long periods is dismal, is discounted. Recently, there was a report (Bhatia 1986) about radioactive parcels lying unattended with the other cargo at Delhi airport for more than 3 weeks, in direct and gross contravention of the pious rules.

In-plant retention of the hazardous material (Oakley and Logsdon 1976) which has been considered, must be ruled out as a solution due to the certainty of evertual human negligence or what can be cupomistically called act of God.

Discharge of nuclear waste in large water bodies, such as lakes and seas is dangerous. It was based on the presumption that the density of the pollutants would get diluted due to convection. This is a blind physical view. There arc many living organismns 111 the wattr bodies. Among them, autotrophic organisms absorb, requisite chemical elements for their sustenance directly from inar imate environment. Heterotrophic organisms live on nourishment they get from other organisms. Autotrophic organisms and an hierarcly of heterotrophic organisms comprise food chains or trophic chains (Lapo 1982) through which elements can be concentrated. Concentration of manganese, iron, vanadium and silver in some microorganisms can be by factors of 1.2 x 10^6, 6.5 x 10^5, 4.2 x 10^1 and 2.4 x 10^5 respectively (Lapo 1982). It is known that all the elements in periodic table can be used as constituents of living matter, and hence can be concentrated by living organisms. Acantharia use strontium to build their skeleton. Some plants also concenttrace various elements. In fact, the vegetation cover on the earth every year concentrates mineral matter in quantities that can be compared to those of most of the elements in lithospheric reserves, which have taken a geological time for accumulation (Lapo 1982). Not just the single species but whole ecosystems may be involved in concentration of elements. Many nitrogen-containing substances are eventually excreted by the animals. Many other elements after food-chain transport may be concentrated in the excreta of the animals. Uranium is one such element. On the sea coast of Peru the guano has uranium content higher by a factor of 10^4 ascomparcd to the sea water (Lapo 1982).

Apart from concentration of elements through food chains, living matter also performs vertical transport of matter against gravity (Lapo 1982) so that nothing can be assumed to be safely deposited at the bottom of the water bodies permanently and forgotten. The consequences of this role of the organisms arc very dramatic. DDT and radio-nuclides arc found ubiquitously in the tissues of organisms. Even the Antarctic penguins have not missed these in spite of neither DDT nor nuclear power being introduced there and the penguins being fightless. This is because trophic chains engulf the whole worlds' food supply (Willard 1976). Thus radionuclides have already polluted all the food chains. View this in conjunction with the fact that due to his omnivorous character, most, if not all, food chains converge in man, and the true ghastly nature of nuclear pollution of water bodies or for that matter, any corner of the biosphere, would be obvious.

How Many Grains of Salt ?

The present strategy of nuclear waste disposal *is* 'concentration and confinement' (Morgan 1976b). The Atomic Energy Commission (US) report in 1972 stipulates that the high-level radioactive waste be solidified and transferred to a repository owned by the government Karam 1970). A repository is supposed to be completely isolated from the biosphere so that the pollutants cannot percolate into any food chain. Further it is supposed to be a permanent storage facility, so that once the pollutants are deposited there, no more surveillance should be needed. According to one estimate soon about 1000 acres of land per year would be needed to bury radioactive polhartants (Karam 1976).

It was propoded in 1971 by the Committee on Atomic Energy (US) that the radioactive waste be buried in salt mines near Lyon, Kansas. The Atomic Energy Commission was to buy 200 acres of exhausted salt mines plus 800 acres of adjacent salt formations. Thus the scale of the problem is utterly underestimated. AEC regarded salt to be the *most economical encasement* for nuclear waste. It believed that as the temperature rises due to radioactivity, the salt would melt and fill the existing and prospective cracks in the surrounding rocks, providing good isolation. But the U. S. Geological Survey has criticized these conclusions (Hicks 1975). They have argued that all the boreholes in that area cannot be satisfactorily plugged, that subsurface water has been leaking, into the salt formations in that area, that the AEC model considered rock sections to be compounded of sand and shale as against laminated salt and shale which is the actual structure, that the compound effect of subsidence, heat flow, thermal expansion, etc, could break the seal of rock above, facilitating the surface and subsurface water to leak (Hicks 1975).

Number of inferences can be drawn from this controversy. (Firstly, the proponents of nuclear power arc committed to claiming that waste disposal is no problem. They will not tell us that a 1000 megawatt reactor produces more radioactive strontium, cesium and iodine than all the nuclear bomb tests conducted so far, or that the radionuclides generated during the production of one Kilowatt of nuclear power have the potential to kill 2,000,000 persons (Hicks 1975). They would rather tell us that our share of nuclear pollutants could be merely a fraction of a teaspoon (Gofman 1976) or that there are 500,000 square miles of salt in the U.S. alone (Riordan 1981) as if storing radioactive waste is the only utility of salt deposits.

Secondly, they are worshippers of economism. They would seek not a safe, but an economical solution to the problem of waste disposal. They would conduct an 'objective* cost benefit analysis to prove their point. Lost human life is merely so much monetary cost for them. Thirdly, they would not hesitate to suppress or falsify facts (Riordan 1981). "A half-truth is like a half-brick - it travels further", could be their motto (Mark Twain quoted in Hicks 1975). Fourthly, they have a limited temporal vision. If they can obfuscate issues over their life-time, they would be happy. 'Trusteeship of future generations' etc, arc not the notions that can appeal to them. That plutonium-239 has to be stored safely for 500,000 yrs is not an unsettling fact for them. Fifthly, in the present political set-up they arc allied with the rulers, so that no amount of popular resentment can really come in their way. Russell (1931) has written that Leonardo and Archimedes were permitted "to add to human knowledge on condition that (they) subtracted from human life". One wonders whether the governments and the nuclear protagonists have some such understanding !

Conclusion

Nuclear power is a fait accompli. The solution to the problem of nuclear waste disposal discussed in the section above should be thoroughly criticized from the geophysical viewpoint taking into account all the aspects such as thermal considerations, subsidence, tectonism, seismicity, volcanism, ground water flow, etc. Exploration geophysics deals with discovering minerals and structures conducive to the accumulation of minerals so that they can be mined. In the present context, it should study the structures where lethal pollutants can be hidden and isolated for long periods of the order of 500,000 yrs and judge whether proposed structures are, in fact, appropriate for the purpose. It may be remembered here that a committee with geologists, hydrologists, mining and petroleum engineers constituted by the National Academy of Science (US) had recommended that no waste disposal practice should be initiated merely because it is safe today unless it is guaranteed to be safe in future also when the waste production would be significantly larger (Hicks 1975).

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The Fission Connection

Recent events in W. Germany have confirmed the worst fears of antinuclear groups regarding safe handling of wastes. A bribery scandal linked to the illegal shipment and storage of nuclear waste has dealt a severe blow to the image of the nuclear power industry.

The scandal came to light in early December '87 when bribery charges were brought against employees of the nuclear waste transport firm Transnuklear, located in the city of Hanau. One of the employees commtted suicide in prison after admitting his guilt. On 17th December it was revealed that Transnuklear had shipped more than 350 barrels of radioactive waste under false labels to temporary storage sites in W. Germany. The waste was intended to be processed in a Belgian reprocessing plant at Mol, and returned.

Mislabelled barrels besan turning all over the country and the numbers grew day after day, throughout the Christmas holidays. More than 1900 barrels were found and it was discovered that 321 barrels were contaminated with traces of plutonium and cobalt-60. Prosecutors are investigating why and to whom millions of marks bribes were paid by Transnuklear.

The next episode in this saga was of reports that bomb-grade fissionable material both plutnium and enriched uranium had been smuggled from W. Germany and Belgium to Pakistan and Libya. One report also talked of Britain and Holland being in on the deal which had allowed Pakistan to acquire 45 kg. of enriched uranium.

All these facilities in W. Germany and Belgium arc under fullscope safeguards. This means that they are under continuous inspection by inspectors of the International Atomic Energy Agency (IAEA) and the European agency (Euratom). The main objective of the inspections is precisely to prevent diversion of fissonable material to 'other' uses from nuclear facilities.

The latest in this continuing drama were allegations in the German magazine *Der Spiegel* that IAEA had great trouble in monitoring significant quantities of nuclear material. These allegations were based on an internal report prepared by the IAEA itself. The magazine said that in March 1986, the IAEA did not know the whereabouts of 188 significant quantities (SQ) of Fissionable Material which were to nave been transported from one nuclear facility to another. One SQ is the amount needed to build one atomic bomb.

The IAEA director Or Hans Blix has ordered a departmental inquiry into W. German nuclear industry's possible vioations of safeguard procedures.

Glasnost in the DAE ?

A few weeks ago, the department of atomic energy (DAE) did something unusual. It actually agreed to allow its senior officials to participate in a public debate which included a few critics of the country's atomic energy programme.

Five top officials—including the DAE secretary and chairman of the Atomic Energy Commission (AEC), Dr M.R. Srinivasan, and the director of the Bhabha Atomic Research Centre (BARC), Dr. P.K. Iyengar—took part in a panel discussion on "Issues in Nuclear Technology" organised by the BARC Officers' Association in Trombay. Ranged against these scientocrats were five "outsiders" with unequal access to information but with arguments at least as strong as theirs. They included Ivan Fera of *The Illustrated Weekly,* Amalendu Dasgupta, formerly of *The Statesman,* G.S. Bhargava, formerly of *The Indian Express*, Dr Dhirendra Sharma of the Jawaharlal Nehru University and myself.

The debate, structured with a bias in favour of the DAE officials, ranged, over four hours and a number of questions, from safety of nuclear energy, weaknesses in the management of the Indian programme, the nature of nuclear decision-making, the adverse economics of atomic erergy, the inappropriateness and limitations of nuclear power in the Indian context, and alternative sources of energy and their future.

It would not be an exaggeration to say that critics gave the worthies of the establishment a run for their money. The DAE was throughout on the defensive, although the discussion was organised in such a way that it was allotted much more time and nearly always had the last word on every issue.

The discussion also showed up many chinks in the DAE's armour, not excluding the ignorance of some of its officials about a number of issues : the energy scenario, the generic problems of nuclear, safety, the severe limitations of the perspective of "electrification" (centralised power generation and distribution) on which the case for nuclear power is founded, and the economics of atomic energy as well as renewable energy sources.

It also revealed that more than anything else, it is sheer faith, irrational faith, in nuclear fission as an ideal source of bulk electricity that underlies most DAE officials' case for ' atomic power.

Iyengar attempted a rather creative interpretation of the process of debate which showed up so many anomalies in the Indian nuclear programme. He announced that *glasnost* (openness) had been launched in the department—thus inadvertently admitting that all these years the DAE has remained closed, top-heavy and bureaucratic—a case that was, or course, ably argued by the critics.

The one-day discussion had several interesting features. It saw Srinivasan admitting publicly—for the first time that any AEC chairman has done so—that renewable energy sources do have a bright future and that nuclear power is *not* the sole future source of energy in a world where fossil fuels arc running out. This represents a marked improvement over the obnoxiously dogmatic and arrogant "nuclear energy only" positions adopted by AEC chairmen in the past.

Srinivasan also emerged as the ablest, indeed the only able, defender of the nuclear programme among DAE bigwigs, to the extent that the peogramme can be defended at all. Iyengar did not even address himself to the question and chose instead to glorify nuclear fission and the bomb as the "greatest scientific achievement" of mankind. He then proceeded to speak of the Madhava cult saints and the deep foundations of Indian scientific tradition !

A. K. De of the Atomic Energy Regulatory Board—that toothless safety agency which is subordinate to the AEC and does not even pretend to be independent of it-emerged as an uncritical supporter of the DAE. Ho had nothing to say about the "instructions" that the AERB is entitled to issue to the DAE in respect of safety' and its refusal to grant clearance to the latter's projects .and practices. With AERB as servile as it is to the DAE, remarked a panelist, the public can expect nothing from it.

S.L. Kati of the Nuclear Power Corporation asserted, without producing any evidence in support, that the DAE is capable of designing and building a 500 MW reactor. He then went to ask if solar cell-based electricity would not occupy too much space creating in effect a solar cell umbrella over our heads 1 (in fact, a one-watt cell occupies an area of only 1 cm^2; hence a 500 MW solar station will not occupy more than a fraction of the hundreds of hectares of land that the DAE takes over for even the smaller of its projects.) But that is another matter.

M.H. P. RAO, who has just retired from the Nuclear Power Board, conceded that the economics of nuclear power is partly a question of subjective choices and the values imputed to various components of costs.

The critics kept up their fire on several grounds : problems of decommissioning and waste storage (disposal being a virtual impossibility); the high costs of heavy water and of nuclear power; the failure of a centralised bulk power generating system to meet the real needs of the mass of the Indian population; the attractiveness of the alternative renewable energy sources and their safe environmentally benign nature; the weaknesses in the indigenous effort and the resulting dependence on foreign sources of design and supply; and, of course, the serious problems of nuclear safety at each stage of the so-called fuel cycle (better called fuel-spiral).

Compounding these are the disturbing features—callous neglect of safety, overexposure of employees to radiation and unconscionable secrecy—that characterise the Indian nuclear programme.

Srinivasan promised to be forthcoming with more information on "every aspect of the nuclear power programme" and to make public disclosures on many programmes hitherto considered to be out of the scope of public scrutiny. He stressed that he is as concerned as the public about safety, site selection and exposure limits and believes in sharing the necessary information.

However, when pressed to answer if he would agree to associating independent environmentalists, experts, health and safety specialists and other scientists, as well as members of the public liable to be affected by nucler projects, with the process of decision-making and review of site selection, emergency procedures, safety standards, etc., he maintained a studied silence.

Evidently, *glasnoss* does not go far enough in the DAE. But one can only hope that it will make some progress and that public scrutiny and evaluation of the department will be institutionalised so that the empire of the atom becomes accountable to the people so long as it exists.

Praful Bidivai

Praful Bidwal a journalist, has been for long a critic of the nuclear establishment. He is presently working as Assistant Editor, Times of India.

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NOTICE BOARD

ANN Newsletter : Anti Nuclear Network, an organisation based in Bombay was formed as a consequence of the visit of Dr. Helen Caldicott to India last year. They have brought out a newsletter -the first issue of which is a four page cyclostyled sheet. They intend to bring out six issues a year. The subscription price at Rs 25/ycar appears to be somewhat somewhat stiff but I suppose the same might be said of *Anumukti.*

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The scarcity of antinuclear material in Hindi has been a great weakness. Specially now that the rumblings of an antinuclear movement have begun at Narora, this weakness is all the more keenly felt. Dr. Dhirendra Sharma is writing a book in Hindi trying to fill this gap. The book will be about 150 pages in length and will be priced around Rs. 15. Commitments of prepublication sales would greatly help.

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An essay competition is being conducted by Philosophy & Social Action on the theme Nuclear Free World : Nuclear Power and Weapons. The last date for submission of essays to the organisers is 31st May 1988. There are awards of Rs 750, Rs 500 and two each of Rs 250 for essays judged best on grounds of original research, futuristic outlook and creative suggestions for restructuring a pose-nuclear social order.

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THE WINDSCALE ILL WIND

Politicians and scientocrats have always had a *very cozy relationship. The shared vision of 'power' and 'progress' have enabled them to ride roughshod over the publics' right to know. The following story documents some of the facts of the Windscale fire of* 1957 *and shows how the facts were suppressed in the interest of promoting nuclear power.*

A chilling picture of management incompetence is described in secret papers on the 1957 Windscale fire released by the British Public Record's Office.

The papers reveal there was no basic operating manual, that temperature gauges were in the wrong positions, and that the laboratory where milk samples were tested was out of action at a critical time.

The operators of Britain's first plant built in a hurry to make plutonium for nuclear bombs were close to panic as the fuel temperature rose to 1,300C. In an attempt to contain the damage, fuel channels were dislodged by what one senior manager described as "brute force".

These papers were released on 1. 1. '88 under the (British) rule which allows public access to government documents after 30 years.

But there is one significant omission among the hundreds of papers made available : the evidence of individual witnesses to the committee of inquiry into the fire has been withheld for a futher 20 years.

The Windscale fire remains the most serious nuclear accident in the West, worse than the meltdown at Three Mile Island in the US 20 years later.

Windscale was a military facility producing plutonium for the British nuclear tests of the 1950's. On 7th of October 1957, Pile no I was shut down for a routine fuel element change. However, certain physical processes resulted in an unexpected build up of heat which caused the cladding surrounding the uranium fuel to catch fire. This lead to the oxidation of uranium which in turn caused the graphite block containing the fuel elements to ignite, The ensuing fire raged for three days. The Windscale piles were cooled by air blown through fuel holes which was subsequently discharged into the atmosphere through two 125m chimneys. In spite of the fact that these chimneys were fitted with filters, a huge amount of radioactivity was released, spreading fallout over the UK, Ireland and much of western Europe.

Because of the military nature of the reactor, publicity about the fire and efforts to counteract the fall-out were kept to an absolute minimum. It was not until 13th October that local farmers were told that they would have to destroy milk, by which time the early phase of the radioactive cloud had passed over England.

A meeting of the top management at the Atomic Energy Authority agreed that the publication of a report on the disaster drawn up by the inquiry under Sir William Penney, "would severely shake public confidence in the authority's competence to undertake the tasks entrusted to them and would inevitably provide ammunition for all those who had doubts of one kind or another about the development and the future of nuclear power."

But it was not the authority which wanted to suppress the report, nor the chief scientist on defence, Sir Frederick Brundrett, who said there was "no security objection" to its publication.

Papers declassified show that it was the Prime minister, Harord Macmillan, who was determined to suppress the full damning picture.

Macmillan told his colleagues that the Penney report was "a highly technical document." He had come to the conclusion that "it would not be in the public interest to publish it."

Macmillan's real reasons were geopolitical and had nothing to do with public health and safety. He did not want to jeopardize U.S. transfer of nuclear technology to Britain and secondly he did not want to disclose details of military plutonium production at Windscale,

The fire burst cartridges containing uranium and possibly, it was said at the time, some containing lithium magnesium, material for the trigger mechanism of a nuclear bomb, The report by Lord Penney—the AEA number responsible for weapons research and development— recorded that "a major technical defect contributing to the accident was inadequacy of instrumentation for safe and proper operation. The absence of an operating manual must, it said, be regarded as "a serious defect". The brief instructions that were available were "clearly inadequate".

It was frequently necessary, the report said, for people in charge of the operation to climb 70 feet to the roof to inspect temperature gauges, which in the event were wrongly set. There was no lift.

There was "uncertainty" about who was responsable for making technical decisions and these were not comminicated to those who should have been told. "In our view," the connittee of inquiry said, "one of the lessons of the accident is that the Windscale organisation is not strong enough to carry the heavy responsibilities at present laid upon it."

It added on the health implications : "It appears to us untisfactory that tolerance levels in respect of several of the possible hazards should have had to be worked out in haste after the accident had happened."

Some of the these criticism were included in a white piper 01 the accident published on November '8 1957. But the white paper contained "reassuring paragraphs on public well-being," which were demanded by tord Mills, the minister of power.

In an annex attached to the white paper, the Medical Research Council said it was satisfied that *"it* is in the highest degree unlikely that any harm has been done to the health of anybody, whether a worker in the Windscale plant or a member of the general public. The secret reports, the papers released show, also reflect this assumption even though it was recognised publicly that no work had been done on calculating the effects of sudden short-term exposure to radioactive fall-out.

A report on the "Health physics aspects of the emergency", released, refers to "nigh contamination" on the early afternoon of October 10, 1957 ,the time of the start of the fire. By 2.30 pm, it says, a stack monitor reading, of 520 curies was recorded, compared to a normal reading of 10-20 curies.

One scientist at Windscale, Frank Leslie, the papers disclose, was unhappy about the handling of the accident. He wrote to the *Minchester Guardian* criticising the AEA for not warning people to remain indoors. Macmillan's response was, "Dr Leslie must be an opinionated ass."

30 years later, the pipers reveal Macmillan himself as both pig-headed and callous.

Sources : Richard Norton-Taylor in Sunday Mail (10.1/88)
WISE News Communique 282.2845.

HATCH REACTOR ACCIDENT

The Elwin Hitch nuclear power plant near Baxley, Goegia ha; experienced what has been discribed as the worst accident at a temporary facility for high-level radioactive waste in US commercial nuclear power history.

Approximately 141,000 gallons of radioactive water leaked out of storage pools, containing spent nuclear furl rois from the plant (levels of radioactivity are several times higher in the Hatch fuel pool than they are in the plant itself). An estimated 84,000 gallons passed through storm drains into a wetlands area located on plant property near the Altamla river. But .it has not been concluded how serious a health threat it may pose to the 50,000 inhabitants who live downstream.

The leak was discovered December 3, 1986. The radioactive waste continued flowing from the spent fuel storage pool for over eleven hours and water levels in the pool eventually dropped five feet. The accident occurred when several safety systems including the leak alarm system failed. This lead to a series of events earlier deemed highly unlikely, if not impossible, by the Nuclear Regulatory Commission (NRC). It also appears that operators had failed to repair a key safety valve they previously knew to be broken. This failure, along with other operator errors, caused the leak.

Source t WISE News Communique : 266.2237

Editors Note : Though this news is more than a year old, we are publishing it firstly slaces it did not make the Indian newspapers tad secondly because it provides an illustraction of the dangers posed to surrousdings by temporary storage of radioactive wants as nuclear plant sites as is also the practics in India.

Down's Syndrome: A Result Of The Windscale Accident ?

Research by Dr Patricia Sheehan, a specialist on Down's Syndrome from Dublin, Ireland, has Connected Down's Syndrome to radioactive contamination. Dr. Sheehan detected this relationship through a coincidence when, in 1974, a young mother with a Down's Syndrome baby came to her office. While the child was being examined, the young mother mentioned that babies with Down's Syndrome had also been born to some of her school friends.

Down's Syndrome, also known as Trisomy 21, is called after Langdon Pown, who over a hundred years ago first described the classical symptoms. Professor Lefebvre in Paris discovered that the disease is characterised by the presence of an extra chromosome. The cause of the extra chromosome is not fully understood It is considered that the age of the mother is important, as it occurs more frequently when the mother is over the age of 40 yean. Thus Dr. Sheehan felt the remark of the young mother was reason to make contact with other pupils of the school she had attended.

As it turned out, babies with Down's Syndrome were born to six out of the 213 women who had attended the school at the same time as Dr. Sheenan's client. The young women were then 12-18 years of age. Of this group, 53 were married when the study began in 1974. Of the 53. six of them were found to be infertile. The remaining 47 fertile women had a total of 142 pregnancies between them, resulting in 121 normal births, two neonatal deaths due to congenital heart disease, two cases of spina bifida (a genetic problem which causes babies to be born with cleavage of the some), three miscarriages, nine spontaneous abortions, one case of cystic fibrosis and the six cases of Down's Syndrome. Six cases of Down's Syndrome occurring in 142 pregnancies, is an incidence of one in 24 and is significantly higher than the accepted overall incidence of one in 600. This is unlikely to have occurred by chance.

The mothers lived in different areas, and the babies were all born at different times. The only thing the mothers bad in common was the fact that they had all attended boarding school together in Dundalk, on the east coast of the Republic of Ireland, during the school year 1957-1958. It was during this period, in October 1957, that the fire in the Windscale reprocessing plant occurred. Meteorological records show heavy rainfall during that period in. Dundalk. Also, in October of 1957, an outbreak of an illness, similar to influenza, occurred in the school.

When Dr. Sheehan began her study, she was looking for, a possible infective cause in the closed community of the boarding school. However, the possible connection with radioactity and with the Windscale accident could hardly be ignored in view of the coincidence in timing and the relevant information from the meteorological office's records.

This is not the only report of a connection between radioactive contamination and Down's Syndrome. Last year, the West German Institute for Human Genetics detected a significant increase of Down's Syndrome m children born in January 1987 in West Berlin. Researchers early on suspected a direct association with the Chernobyl accident as it had occurred in April of 1986, nine months prior to the increase in cases of Down's Syndrome. The study area was then extended to include the whole of West Germany. The author of the resulting report denied a connection, but in the view of other scientists who later examined the material, 'the significantly higher number of Trisomy 21 cases m children conceived shortly before Chernobyl bore out such a. connection.

Soures: WISE NC 284.2871. 14 December 1987

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Sampoorna Kranti Vidyalaya,
Vedebhi, Via Valod.
District: Surat 394 641.
Editor: Surendra Gadekar
Printed at:
Bhargava Bhushan Press, Vara nasi.-6/2-88

PRINTED MATTER BOOK POST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol. 1 No. 5 April 1988

> *What does the father say then to his little girl when he hikes her up a certain hill ?*
> *He says "Don't he afraid little dove.*
> *Under this hill is buried an old atomic power plant, but it's perfectly safe."*
> *And then, when the frightened little girl still doesn't want to climb it, what does he tell her ?*
> *He says "But, really, it's quite all right.*
> *Here, if you're frightened, give me your hand. Now give me your other hand. Now give the your other hand..."*
>
> **Chernobyl: A Novel** ***Frederik Pohl***

Two years ago this month a 'temple' of modern Russia blew its top. The radioactive poisons contained in it were spread far and wide. The air we breathe, the waters we drink, the land on which grows the food we eat all were affected. How many people died *i* How many more shall die in the future ? Experts have come up with numbers which differ from each other all the way from a few thousand to hundreds of thousands. The fall-out from Chernobyl was measured by a large number of independent observers and is not significantly disputed among experts. Then why are their estimates of the resulting malignancies so significantly different ?

Effects of large doses of radiation—like those suffered by people of Hiroshima and Nagasaki arc immediately apparent. Besides an early death, they include skin burns, cataracts, loss of hair, loss of apctite, nausea, vomiting and sterility. But what *of* those who live far from Chernobyl or live near normally running nuclear plants ? It is the unapparent and distant damage caused by low doses of radiation, which is a nutter of dispute.

The main cause of the dispute is the systematic campaign of disinformation carried out by promoters of nuclear power. People have been consistently told that cancer hazard from radiation exposure is smaller than it truly is. For decades the myth of a 'safe threshold dose'—below which radiation was harmless or even beneficial - was propagated. Today even that citadel of 'expertise', the International. Commission for Radiological Protection (ICRP) accepts that there is no safe dose of radiation. In fact al) the latest data have confirmed that the critics of nuclear industry have been right all along : radiation damage is cumulative and irreversible. Radiation is low doses is more harmful than previously believed. (Sec article "Radiating Complacency" in Anumukti vol. 1 number 3, Dec- '87)

Radiation like political rhetoric pays special attention to the weaker sections of the society. Sensitivity to radiation induced cancer is highest at youngest ages of exposure. "When a population of normally mixed ages is irradiated, about 73% Oi the cadiation induced cancers develop in people who were aged 20 years or younger at the time of exposure." (Goffman : Radiation and Human Health) The sick, the hungry and the very old are more prone to radiation harm than healthy adults. Women are twice as susceptible to radiation induced cancers as men.

Cheer-leaders for the nuclear industry have repeatedly claimed that many more people die from spontaneous cancers than shall die of Chernobyl cancer; in fact, that Chernobyl cancers will be undetectable. That is true. But undetectable is not the same as imaginary. Even a million real malignancies do not alter cancer statistics because a million is within the 'error bars'.

Information can be a deadly weapon. It is not only an 'act of Go a government made famine or an atomic bomb that can kill a million people. Disinformation which understates hazards does the task equally well. "In the USA alone 1½ million people per generation will get unnecessary cancer just from the unnecessary nigh doses used in medical diagnostic X-rays." (Goffman &: O' Conner : X-Rays : Health Effects of Common Exams)

It is a strange morality which finds it acceptable to kill other human beings so long is the victims remain faceless undetectables. The only antidote is a well informed citizenry which is not shy of resistance. Edmund Burke put it well long ago : "All that is necessary for the triumph *of* evil is that good men do nothing."

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Radiation Effects in Tahiti

'Throughout the Pacific we're now seeing the same diseases and conditions that occured at Hiroshima and Nagasaki. - stillbirths and growth retardation," says Or. Tony Atkinson of the International Physicians for the Prevention of Nuclear War (IPPNW). Atkinson was speaking in relation to the over 225 Tahitiaus who had paid thousands of dollars to fly to New Zealand for cancer treatment rather than attend free hospitals with sophisticated equipment for cancer treatment run by the French military in Tahiti.

The Tahitiaus distrust the French military because they believe that their cancers are a result of the French nuclear testing at Mururoa. Until now there has been no way of conclusively proving this. Dr.Atkinson soon hopes to be able to begin a study in Tahiti aimed at analysing residents' teeth for Strontium-90-u known radionuclide.

In Tahiti's military run hospitals, patients with cancers suspected of being radiation induced have their files declared security documents This particularly applies to those who have serviced ships and planes on Mururoa. There's almost a total security blackout on the health of Tahitians. The health statistics are falsified and don't list everyone who dies, he says. Until 1980, when the World Health Organization intervened, French authorities in Tahiti did not even keep a cancer registry. There are still not statistics for thyroid cancer in Tahitian men - known result of radiation exposure after a bomb explosion.

French Polynesia has the highest number of cancer deaths in the Pacific. Cancers caused by radiation such as leukemia, for example, arc double what they arc in American Samoa on the other side of the Pacific.

Source : WISE News Communique : 286.2901

How Many Chernobyls ?

The Nuclear Power Industry Could Produce Three More Chernobyl-Sized Accidents by the Year 2000

Through April 25, 1986, the Chernobyl 4 nuclear reactor was one of the world's most reliable. It had the best operating record of any power reaction in the Soviet Union, producing at 83 percent of capacity in 1985. But on April 26th it exploded, hurling the contents *of i*ts radioactive core across Europe.

That such a seemingly reliable reactor should be the site of the world's worst nuclear power accident raises fundamental questions about the safety of nuclear power everywhere. Like Three Mile Island before it, Chernobyl reminded us that capturing the energy of the atom is, by its nature, a risky proposition. But how risky is it? How many Chernobyls might nudear power have in store for us ?

Long before Chernobyl, nuclear experts had agreed about the possibility of accidents killing people and irradiating large areas. Indeed, despite major design differences between the Chernobyl plant and those used in the West, che risk of a serious accident is one characteristic that all large nuclear reactors share.

The real argument is over the frequency of serious accidents. Defenders of the industry claim catastrophic accidents are extremely rare events. At the United States Atomic Energy Commission, precursor to the Nuclear Regulatory Commission (NRC), Dixie Lee Ray often argued that nuclear power was safer than eatng because more people had choked to death than had died from nuclear power.

Since the accident at Chernobyl, however, t seems inevitable that many people will die from nuclear power, and for the most part, the risk they have taken is an involuntary one.

The Calculus of Catastrophe

To calculate the odds of nuclear disaster, engineers developed a modeling tool in the early 1960s known as probabilistic risk asscssnaeut. Using this method, analysts study accident scenarios and failure probabilities of critical components, estimate safety margins, and develop overall estimates of risk.

Government-sponsored studies in the United States and West Germany have estimated that severe nuclear core-damaging accidents should occur once every 10,000 "reactor years." (A reactor year is a unit used in discussing experience in operating nuclear reactors. The world's current total of 366 operating nuclear power reactors chalked up 36ft reactor years in 1986, for example, regardless of how many days they were actually on line.)

Even if the one-in 10,000 figure, is correct, assuming that 500 nuclear plants are in operation by the late 1990s, there would he one core-damaging accident every 20 years. However, a post-Three Mile Island study by the Oak Ridge National laboratory in 1982 raised the risk to once in 4,000 reactor years or once every eight years.

Experience so far indicates that these otinntes are based on uncertain assumptions that often do not reflect actual plant conditions. For example, circuit breakers connected to crucial safety systems at the Salem nuclear plant in New Jersey were estimated to have a one in 33,000 chance of failing. Yet, two circuit breakers malfunctioned in one week. Only prompt action by an alert operator prevented a serious accident.

Redundant safety systems have also been simultaneously destroyed, supposedly a highly improbable event, leaving no margin for safety. The 1975 Browns Ferry fire in Alabama destroyed several redundant electrical systems, shutting down the control room and threatening catastrophe.

The limitations of probabilistic risk assessment as an accurate forecasting tool were detailed in a 1986 report by the Paris-based Nuclear Energy Agency, which concluded that they arc useful in evaluating the reliability of particular plant components but of uncertain validity when assessing overall safety.

So far nuclear power has been more accident-prone than predicted by the experts. Three Mile Island occurred after 1,500 reactor years, and Chernobyl after another 1,900 Core-damaging accidents arc occurring at over twice the rate predicted by the Oak Ridge study, casting doubt on the accuracy of these major probabilistic assessments.

Of course, not all core-damaging accidents result in major releases of radioactive material, at Three Mile Island the secondary containment vessel held virtually all the core material inside. On the other hand, much of the Chernobyl core was deposited on forests and farmland thousands of kilometers away.

With more nuclear power plants coming on line, especially in Europe, the chances and likely frequency of a serious accident arc increasing .is well. Assuming a continuation of the accident rate of one core-damaging accident every 1,900 reactor years, there would be three additional accidents by the year 2000.

At that point, with 500 reactors in operation, core-damaging accidents would occur every four years. Scientists *in* Sweden and West Germany have used this data to estimate a 70 percent probability that another such accident will occur in the next 5.4 years.

These figures are not a prediction of what will happen in the future, but rather an indication that the worldwide nuclear accident rate has already become unacceptable. The nuclear industry cannot, and perhaps should not, survive the public opposition that would be the unavoidable consequence of a continuation of this dismal history.

Blind Faith in Technology

When Pennsylvania's Governor Richard Thornburgh toured nuclear facilities in the Soviet Union in 1979, he was informed that nuclear safety was "a solved problem" and that it would soon be possible to safely operate a reactor in Red Square. Three Mile Island, he was told, had little relevance to the Soviet nuclear program.

Complacency and arrogance clearly helped sow the seeds of disaster in the Ukraine. The Chernobyl plant exploded when operators overrode multiple safety systems during a test. These actions, along with statements by Soviet officials, demonstrate that the Soviets had an almost blind faith in technology.

Ironically, the excellent performance of the Chernobyl plant may have bolstered this overconfidence, encouraging the operators' blatant violations of safety procedures.

The accidents at Chernobyl and Three Mile Island can be traced to human mistakes and, more specifically, to the "man-machine interface" at the center of complex technology.

The President's Confuession on the Accident at Three Mile Island stated in its 1979 report : "Equipment can and should be improved to add further safaty. to nuclear power plants-But as the evidence accumulated, it became clear that the fundamental problems are people-related problems and not equipment problems."

The conclusions of the official Soviet report on the Chernobyl disaster were similar : 'The prime cause of the accident was an extremely improtable combination of violations of instructions *in* operating rules committed by the staff of the unit.-The accident assumed catastrophic proportions ...... because all the negative aspects of the reactor design...were brought out by the operators."

The fact that operators helped cause both accidents means that plant control systems and operator-training programs need to be upgraded. It does not mean, however, that the solution is to replace human operators with robots. Computer systems can malfunction or be mispogranuned, and some aspects of plant operation require human judgment. As long as people run nuclear power plants, human error can never be entirely avoided.

Incidents in the United States demonstrate that carelessness and willful violation of operating procedures arc not confined to Soviet nuclear plants. Less than a year after Chernobyl, an engineer at the U.S. Nuclear Regulatory Commission detailed a longstanding pattern of operators turning off important safety systems unknowingly or through carelessness. Were problems to develop while these safety systems were turned off, then an otherwise manageable situation could have gone dangerously out of control.

Irresponsible operators are another problem. In April 1987, fourteen of twenty-six nuclear workers of the Tennessee Valley Authority, America's largest nuclear utility, tested positive for drug use. At other nuclear facilities, cheating on operator licensing exams has become "common.

Operators at the Peach Bottom plant in Pennsylvania were found sleeping in the control room with the reactor at full power in 1987. The NRC shut down the plant, and the owners promised to rectify the situation through a Voltery of measures, including replacing comfortable high-back chairs with low-back models.

A Dismal Record'

Despite post-Three Mile Island improvements, American nuclear plants arc still plagued by problems. There were almost 3,000 plant mishaps and 764 emergency shutdowns in 1985, up 28 percent from 1984.

The average nuclear plant in the U.S. was shut down six times in 1985, and the industry as a whole averaged two shutdowns for day. More than just a sign of trouble, emergency shutdowns are sudden, violent procedures that stress a nuclear plant's intricate and crucial plumbing, and can impair safety.

Although most of these shutdowns were due to minor problems, at least 18 were serious accidents that could have led to core damage.

One of nuclear power's fundamental problems is that even the most trivial incident could one day lead to catastrophe, a fact made possible by the enormous complexity of these systems. Significant nuclear incidents have already been initiated by hungry field mice, a worker's loose shirttail and an improperly used candle.

Intensified Congressional and regulatory scrutiny of the American nuclear power industry since the Chernobyl accident has apparently done little to improve the safety record. Indeed, a string *of incidents in* the year since the disaster show just how far from foolproof reactor safety systems are. The most consistent element in these incidents is human error combined with design flaws.

The nuclear power industry's flawed record since Chernobyl is not just a superpower problem. France, largely quiescent about the risks of nuclear power since the election of President Francois Mitterand in 1981, and now reliant on nuclear power for 70 percent of its electricity, was reawakened in April 1987 by two accidents.

At least 25 tons of potentially combustible sodium coolant leaked from the experimental Superphenix breeder reactor on the Rhone River for two weeks before the source could be identified. Next, the Tricastin uranium enrichment plant, also on the Rhone, suffered a leak of highly corrosive uranium hexaafluoride that injured seven workers.

Reports of incidents and controversies since Chernobyl have trickled in from other parts of the world as well, including Brazil, Mexico, South Africa, *Spain* and the United Kingdom. Because many countries do not report accidents at nuclear installations, and consider all nuclear issues to be state secrets, it is quite possible that the list of reported incidents remains incomplete.

Aging Nucear Plants

There are other problems on the safety horizon. The world now has a growing number of aging nuclear plants, many beginning to show signs of deterioration. In 1990 there will be 35 plants that are at least 25 years old; by 1995 there will be 66, and in 2000 there will be 150.

The nuclear industry has little experience with aging nuclear plants, but is about to get a crash course as many plants have already developed unanticipated problems. Among the most serious are corrosion of steam generators and embrittlement of steel pressure vessels due to neutron bombardment. Both of these problems are rampant in some types of plants; they involve critical components and arc difficult to remedy.

The problems of aging plants were highlighted in late 1986 when Virginia's 13-year-old Surry nuclear plant suffered a "guillotine break" in a hot water pipe. Four workers were killed by steam burns and the plant was closed for several months while the plumbing system was thoroughly inspected.

After the accident, inspectors found extensive corrosion of pipes in areas where decay had never been anticipated. A back-up valve that should have stopped the surge of scalding water had not been properly installed. In some places half-inch pipes had been eaten away to less than the thickness of a credit card.

This incident and others like it indicate that nuclear plants are aging in unexplained and dangerous ways, and that nuclear technology continues to present engineers with unwelcome surprises.

Aging U.S. military reactors may present more immediate hazards than their commercial counterparts, a point reinforced by their similarity in design to the Chernobyl reactor. After Chernobyl, the U.S. Department of Energy (DOE), which runs the military's nuclear programs, was forced to temporarily shut down all of the reactors and processing plants that produce plutonium for nuclear warheads.

Independent reviews showed that the plants were antiquated, poorly managed, largely unregulated and a danger to workers and the general public. Ironically, a Soviet nuclear accident may have saved the U.S. nuclear weapons industry from an embarrassing and lethal mishap.

The first facilities to be closed were two processing plants on the Hanford nuclear reservation, a vast expanse of desert bordering the Columbia River in eastern Washington state. On September 29, 1986, workers began a routine procedure of pumping plutonium, suspended in a liquid solution, from a separation facility to a storage tank in the plutonium finishing plant. Because a transfer line was not sealed, the plutonium was diverted to an already full storage tank.

Had enough of the new plutonium mixed into the full tank, plutonium concentrations could have approached "criticality", risking a nuclear chain reaction and releases of radiation. The Department of Energy ranked the incident as a four on a danger scale of five.

During the same month, the Government Accounting Office (GAO)of the U.S. Congress revealed that several of DOE's nuclear weapons production sites, including the Hanford reservation, were severely contaminated with both radioactive and toxic chemicals. In some places concentrations of the materials in soil and groundwater were hundreds or even thousands of times higher than safety guidelines.

Later, a scries of critical reviews led to the shutdown of the N-reactor at Han ford, the oldest of the nation's plutonium production reactors. The N-reactor *is* the U.S. reactor most similar to the Chernobyl design—it employs a graphite moderator and lacks a full secondary containment vessel.

According to official reports, the plant suffers from aging equipment, poor maintenance and staff complacency. A late 1987 report by the National Academy of Sciences concluded that the Hanford plant and others like it are at risk of a Chernobyl-like catastrophe.

The next wave of shutdowns came in March 1987 when the GAO told a Site committee that four plutonium-producing reactors at Savannah River in South Carolina had operated for most of *seven* years at power levels far beyond what the emergency core-cooling system could have handled in an accident.

GAO investigators went on to detail a pattern of poor management, inadequate external review, and disregard for safety and environmental protection. They characterized the Savannah complex as "costly, diverse, potentially dangerous and aging."

Pending Judgment

How many more Chernobyls ? It is impossible to answer this crucial question. Looking at the experience of the world's operating plants, though, suggests that additional accidents are likely in the next decade.

On the positive side, Chernobyl has increased many countries' stated commitment to nuclear safety, and led to some safety-specific action, such as the long overdue shutdown of plutonium reactors in the United States, and the creation of a cabinet-level position for nuclear safety in West Germany.

Whatever improvements in safety standards Chernobyl may have precipitated, they cannot stop the ultimate, double-fisted enemy of nuclear safety—time. Even if accidents occurred only once every 10,000 reactor years, and if the world's inventory of reactors did not grow beyond 500, core-damaging accidents would occur about five times per century.

Time also slowly wears away at the precise machinery that is central to nuclear technology. The inevitable aging and physical deterioration of the world's nuclear equipment could swamp efforts to make nuclear power safer

Technology, training, strict regulation and vigilant oversight can lower the chance of catastrophe But in the end, the chance remains.

Computer models can help us to understand the risks, but they cannot pass judegnment-they cannot tell us how safe is safe enough. The answer to that question will always fall to human beings.

In the immediate future, tighter regulation, improved management and the willingness to shut down dangerous plants are clearly in order. Over the long run, the merits of the atom must be weighed much more carefully against the alternatives. Ultimately it is the world's people, through their national political systems, who must decide how safe is safe enough.

Christopher Flavin, a senior researced at Worldwatch Institute in Washington, D.C.. *is author of Reassessing Nuclear Power: The Fallout from Chernobyl and coauthor of State of the World* 1987. *Courtsey : World. Watch Jan. Feb. 19*88.

GUJARAT PROTEST

The messing of the Gujarat Anu Urja Jagruti at Vadodara on 14th February, 1988' was significant in as much as it provided an opportunity for evaluation of the present position of the anti-nuclear movement in Gujarat and also a chance to chalk out some long range and short term programmes for the future.

Shri Chinu Shreenivasan's paper entitled "Where do we go ?" provided the basis for critical review and assessment, It was felt that lack of continuity in the movement was a major weakness. It was also felt that not many people give much time to it in spite of their deep interest in the issue. Stress was laid on strengthening the movement both at the grassroots and the state levels. Giving his ideas about the future course of the movement Shri Babubhai J.Patel, ex-Chief Minister, suggested that the information that we have at present should be widely diffused in the public. He also emphasised the need for a dialogue with the state and central ministries. Dr. B.G. Desai, a consultant on energy, pointed out that nuclear policy was after all only a small part of our over all energy policy, which was going astray.

It was decided that educational and organisational activities should be continuously going on in the Kakrapar and Surat areas. The ideas of organising local committees and training camps for local leaders were mooted. It was also decided that some of the larger towns of the area should be covered intensively in the programme of Anu Urja Jagruti.

The following programmes were chalked out for the state level ;

1. To prepare a small pamphlet on the issue and to send it to all the representatives of the State Legislative Assembly and members of the Parliament from the state.
2. To discuss the issue with members of the Assembly.
3. To try to prepare some members to raise the issue in the Assembly.
4. To organise a march on wheels from Kakrapar to Gandhinagar ending on the Chernobyl Day (26th April).
5. To seek an interview with the Chief Minister after the march, and to convey the message of Anu Urja Jagruti to the Prime Minister through him.

Committees were appointed to :

a. Draw a detailed programme for the suggested march on wheels,
b. To collect the money needed for such a march,
c. To find out the possibilities of asking for a legal stay on the construction of the plants.

Editor Bhoomiputra promised to give the nuclear issue much more space in the future numbers.

Editor Anumukti announced that those interested in selling retail copies of Anumukti will be given special commission ou bulk orders.

A small exhibition of charts and paintings was also displayed at the meeting. It was decided to display that exhibition along with film and slide shows during the Kakrapar Gandhinagar march too.

One Deadly Summer

Something strange happened to America in. the summer of 1986 : around 35000-40000 more people than usual dropped dead. A statistical fluke ? Dr.Jay Gould, a fellow of the Institute of policy Studies in Washington and a distinguished statistician, thinks not.

The seasonal pattern of mortality in America is pretty stable. Over the 80 years before 1986, 31.7% of each years deaths occured on average during the four summer months *of* May to August. In 1986 that percentage rose to 33.1% the highest this century and 1.1 percentage points above the 1983-1985 average of 32%. Dr. Gould calculates that the odds of such an increase happening by chance are more than one million to one. So what happened ?

The explosion of a nuclear reactor at Chernobyl in Russia on April 26th, 1986 and, in particular, the ensuing radioactive plume that reached America eleven days later, may offer a clue. When the radioactivity arrived, rainwater samples in northwestern regions of America recorded 46 picocuries (pC) of radioactivity per litre. By May 12th,' in the northwestern state of Washington, the level had risen to 6620 pC per litre. In milk samples—a routine indicator of radioactivity—the concentration of radioactive Iodinc-131 peaked at around 130 pC per litre, compared with che 1985 average of below 7pC per litre. Because the 130 pC per litre peak was less than 1% of the American government's coaling of 15000 pC per litre for milk radioactivity, no action was taken. The levels were after all, between 100 and 1000 times lower than those recorded across Europe after the disaster.

Dr. Goulds analysis picks up a worrying correlation between regional American levels of radioactivity in milk and regional mortality in the summer of 1986. For several reasons - such as rainfall patterns and the precise path of the radioactive cloud - levels of radioactivity varied sharply across America. Dr. Gould calculated averages of peak concentration of Iodinc-131 in milk for each of the census bureau's nine regions during the four month period. The highest concentrations were seen in Pacific northwestern states such as Washington and California. In those states the total number of deaths in four months was 5% higher than it had been in May-August 1985. In areas recording the lowest concentrations - such as the central southern states of Texas and Arizona - the number of deaths was unchanged from the previous summer. That relationship between radioactivity and death held true throughout the country. Statisticians have tests to determine how likely it is that such correlations are blue to mere chance. The tests showed that for these correlations, sheer coincidence was hardly possible.

A Radical Theory

According to received wisdom, exposure to such low levels of fall-out is harmless. Some people even claim that a little radiation is good for you. Most of the debate *on* the medical consequences of Chernobyl has centred on the long term dangers of cancers and genetic defects in future, generations that can be caused by higher doses. Any suggestion that the disaster had immediate adverse effect on mortality rates is heresy. Recently the OECD's Nuclear Energy Agency reaffirmed its belief that the risk of "radiation related harm" to the public in western countries had "not been changed to any noticeable extent" by Chernobyl.

Such claims ignore research into indirect effects of low level radiation according to Dr. Earnest Sternglass, emeritous professor of radiological physics at the University of Pittsburgh. Instantaneous bursts of high level radiation - such as medical X-rays - are relatively harmless to normal adults. That is mainly because such "external" radiation does not concentrate itself in crucial organs. Ingested or inhaled fission products behave rather differently. Once inside the body, they seek out various organs according to their chemical characteristics. Iodinc-131 heads for the thyroid, Strontium-90 and Barium-140 (which chemically resemble Calcium) head for the bone marrow. Then they sit there emitting radiation.

Such low level radiation promotes the slow release of molecules known as free radicals. The most common - Oxygen free radical - arc also a by-product of normal oxygen using reactions. But their production is increased by protracted exposure to radioactivity of ingested fission products.

Oxygen free radicals are unstable oxygen molecules with an extra electron. They arc attracted to the membranes of the cells, which then they damage, disabling the cell. This process is efficient only when there is a low concentration of free radicals. At high concentrations (that is at high radiation doses) the free radicals deactivate each other. That is why America despite its lower close of radiation, the have suffered more from this problem than* parts of Europe.

How could Americas increased mortality rate in the summer of *1986* be related to the damage colsed by free radicals ? Among the celt functions impaired or destroyed by prolonged exposure to free radicals is the production of hormones and various types white cell which provide the body's immune defences. Such an erosion of the immune system might be expected to hit two groups of people first : the old or weak, and those suffering from life threatening diseases.

Of all those Americans aged over. 65 who died in 1986, 32.7% did so in the four summer months. During the same months in .1985, the proportion was only 30.6% This suggests that in 1986 something was hastening their demise. Compared with the summer average *of* 1983-1985, an estimated 7.4% more people died iu summer of 1986 - around 30000 people.

The number of people dying from nncumonia in all age groups was 18.1% higher in May-August 1986 than in the same months of 1985. Deaths from infectious deseases rose by 22.5%, over the same period. And deaths caused by AIDS and its related infections increased by 60.3%. As the table below shows, the year on year changes were much smaller in the first four months (January to April) *of* 1986. And they fell back during the final four months of the year.

American Mortality 1986

No. of deaths from :	Jan-Apr	May-Aug	Sep-Dec
	% change on a year ago		
Pneumonia	-5.7	+18.1	-34
All infectious diseases	+2.3	+22.5	+15.7
AIDS related infections	+ 11.6		+ 19.8

Leaving out deaths caused by accidents, suicides, drug abuse and violence. Dr. Gould found that the natural death rate of all people aged between 25 and 34 was 5.3% higher in 1986 than in 1985. That age group was born in the 1950's, a decade when atmospheric nuclear bomb testing was at its peak. As the}' have aged the mortality rate of the age group has increased much faster than the mortality rate of those born between 1935 and 1944 - before bomb testing started. Doctors believe that fall out from testing may have weakened the immune systems of the very young. In later life that might make them more susceptible to the biological effects of additional fall-out.

Americas seasonally adjusted fertility rate - measured by number of live births per 1000 women aged between 15 and 44 - fell to a record low during July and August 1986. In contrast, live births rose in the first four months of 1986. The fall is due, Dr.Sternglass believes to an increase in miscarriages, foctal deaths and still-births. During the summer infant mortality rates reflected the regional pattern of milk radioactivity.

Both Dr.Gould and Dr.Sternglass emphasize that their work is still in its infancy. But their analysis already suggests that the change in the American way of death in 1986 was not a nutter of chance. If Chernobyl was the cause, a complete review of "safe" radiation levels is needed. And if Chernobyl was not to blame, what was ?

Courtesy : Economist : *Jan* 30-Feb 6 1988.

Editors Note : India suffered similar low level fall out as USA The numbers of the very young, the sick and the malnourished are much larger in India. Unfortunately our mortality statistics arc not good enough to detect this effect.

Utterly Gutterly Butter

The Supreme Court of India by an order of March 8th, 1988 dismissed the special leave petition brought by Dr. S. S. Wagle and others against the Union of India. The petition challenged the marketing of 3000 tons of butter imported from Ireland by the National Dairy Development Board. (NDDB)

For the last two decades we have been in the throes of a flood. Described sclf-promotionally as the "White Revolution" it was designed to nuke India awash with milk. Today rivers of milk do flow through most parts of urban India. Unfortunately, the design envisaged the rivers to originate in the butter mountains of the European Economic Community. (EEC).

The explosion at Chernobyl cast a shadow on this scheme. Large parts of Europe were contaminated by the fall-out. The EEC governments themselves were quick to ban import of food items from eastern Europe even from places a thousand kilometres distant from Chernobyl. Radioactivity respects no frontiers. Significant radioactive fall-out was deposited also on western Europe. The long lasting radionuclides like cesium-137 (half life 30 years) have got incorporated into the soil. From there to grass, cows, milk, humans and back to soil is a simple cycle. The process will go on and on.

The accident initiated an acrimonious debate within the EEC with regard to 'acceptable' limits for radioactive food contamination. The nuclear lobby wanted to raise the existing limits. They demonstrated their clout when the EEC council of ministers on December 14th, 1987 did raise the limits by a substancial amount. This was despite an earlier vote in the European parliament which had recommended ten times lower doses. The major point to note is that 'acceptable' is not the same as safe. There is no safe limit for radiation. This has been accepted by some W.German courts and they have upheld the appeal of a woman who wanted to return milk powder less contaminated than the government approved 'safe' limits.

In the meantime, the food multinationals were busy exporting contaminated produce to the third world. Singapore, which probably has the most efficient system of testing and control, rejected 240 separate consignments of contaminated food just upto October '86. A large number of other third world nations including Sri Lanka, Bangladesh, Malaysia, Philipines and Guyana have rejected milk products from EEC. Some W. German activists last year resorted to direct action by breaking into a train filled with contaminated milk powder and destroying a large-number of sacks meant for the third wo;

India being the largest dump-ground of EEC milk products one would have expected the Indian government to have taken vigourous action to protect the population from this additional menace. Instead, the reality has been very far from this. The burden of protecting public health has been taken up by public spirited individuals like Dr. Wagle *and* others.

Between April T986 and September 1987, commodities imported from the EEC were released on the basis of "certificates of fitness" provided by the suppliers and the Union agricultural ministry. BARC turned a blind eye to alarming reports coming from various third world countries. That these commodities were used throughout the country in milk and also in infant foods appears to be pretty certain.

Wagle's battle began in late 86. Beginning first by cautioning the government not to release the butter, the Maharashtra State Government Employees Confederation spearheaded by Wagle got a recalcitrant NDDB and the Greater Bombay Milk Scheme (GBMS) to undergo tests to determine radionuclide contamination by BARC. But the widely different results of the test, coupled with enormous flaws in collecting samples for the tests and the determination of the state government to go ahead with marketing the butter forced Wagle to move the Bombay High Court. After granting a stay order initially, the petition was dismissed and the matter brought before the Supreme Court.

The main arguments put forth in the petition were the following :

1. "Permbsible levels" implied an accep-

table level *of* risk including the risk of death.

2. Maximum limits are normally expressed in the terms of annual intake for a statistically "standard" man: they are not adjusted for specially vulnerable sections like pregnant women, children and malnourished infants.
3. The "permissible levels were based on an extrapolation from the Hiroshima and Nagasaki data to low doses on ? linear basis. This procedure was seriously flawed asecepted even by the ICRP.
4. NDDB by not labeling the origin of it's products was denying people the right to decide for themselves whether or not to or contaminated food.

Amongst other testimony the petitioners also produced a letter from George Wald, Nobel Laurate and Professor of Biology at Harvard University, parts of which are reproduced below :

"In reality no threshold exists for damaging effects of ionizing radiation or radioactive material ingested or respired. Any level may result in some damage, more does more damage. From that viewpoint, every dose is an overdose.

So-called "permissible levels" of exposure are compromises with convenience, economic pressures, business interests and political expediency, superimposed on a consideration for health. Ideally all such exposure should be avoided. The presence of unavoidable background radiation, perhaps even larger than is offered by some new source, is no excuse for accepting the added threat of the new source.

For persons suffering from hunger it makes a gruesome choice to offer to relieve the hunger at the expense of the threat of eventual malignancies. I can imagine situations in which that ghastly choice might need to be made; but then in full awareness of the risks, and keeping the radioactive exposure to the absolute minimum. The threat is greatest to infants and the young, falling off with age."

The Supreme Court's position is best expressed in its own words : "Having regard to the magnitude, complexity and technical nature of the enquiry involved in the matter and keeping in view the far -reaching implications, we must at the outset clearly indicate that a judicial proceeding of the nature initiated is not an appropriate one for determination of such nutters."

Therefore the court appointed a committee of three experts and decided to follow their advice. The experts were : Dr.M.G.K.Menon-member Planning Commissi, Dr.P.K. Iyengar, chairman of BARC and Mr.G.V. K.Kao, vice chairman, Karnataka Economic Planning Council. Of the three, the first two are representatives of the atomic energy establishment and the third a long term supporter of NDDB. The experts commence reached it's predictable conclusion :

1. "The permissible levels *of* radioactivity in milk, dairy and other f*ood* products fixed by the Atomic Energy Regulatory Board as per it's communication of August 27, 1987 have been arrived ar after due consideration of ICRP dose limits for the general population.
2. The AERB has allowed more safety margin than other countries, and international organisations like EAO and WHO, in arriving at the levels fixed for milk, dairy and other food products. The levels adopted by AERB are one of the lowest in the world.
3. The consumption of milk, dairy and other food products, having levels of man-made radionuclides below the permissible levels fixed by AERB, by all sections of population, and throughout the year, are safe and harmless."

Having taken the attitude that the issue was too technical and complex and hence having decided to rely on expert judgement, the court had left itself with no other alternative but to dismiss the petition. The judgement raises an important issue. It is an individuals right to decide what risk he or she wants to take. The exercise of the right cannot be denied under the pretext that in our daily lives we take similar or greater other risks. By not forcing the NDDB to properly label the origin of its products, the court judgement denies this right.

There is a court higher than the Supreme Court-that is the court of public opinion. It is there that the issue will be fatally decided.

Surendra Gadekar

This is based on articles in WISE and Sunday Mail.

LETTER BOX

Congratulations for publishing a very lucid article 'Another Pyrrhic Victory' in your journal, vol. 1 No. 4, February 1988. While agreeing with some of the observations such as ".......the group that suffers the hazards could be totally different", I would like to point out:i) that the anomalies of the earlier terms such as maximum permissible exposure or dose are removed in the presently accepted international terminology, dose equivalent, effective dose equivalent etc.2) It is preposterous to suggest that nuclear power is incompatible with indefinite sustenance and perpetuation of life on earth in time.3) The author has given us a succinct summary of the concentration process existing in the marine food chain webb, but fails to add that the concentration occurs with the diluted concentration of the pollutants due to mechanical convection.4)Citing D.D.T. alongside radionuclides just because both are considered *to* be toxic is not appropriate as radionuclides do not behave like DDT in the environmcnt.5) I welcome the authors suggestion that all the geophysical aspects have to be taken into account in studying the problem of nuclear waste disposal in deep geological formations.

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Authors's Reply :

To begin with, let me thank Shri Sastry for reading my article with interest and, more so, for commenting upon it. Let me come to points of our disagreement.

We are residents not only of the external-physical world but also of the world of out languages. Every language has its own point of view and prejudices against other viewpoints. Therefore, certain ideas just cannot be thought of in a particular language. This is Whorf's linguistic relativity principle. That was exploited *in* George Orwell's "1984" to develop a language in which revolt against the totalitarian set-up could just not be imagined. That is precisely the game played by the nuclear establishment. Phrases such as maximum permissible exposure or dose, dose equivalent or effective dose equivalent are devised so that the physical reality of cumulative and irreversible damage done by nuclear radiation can be linguistically kept out. Earlier terms were "anomalous" because they did not serve this purpose, effectively. Hence the new terms. But this "progress by renomenclature" is deceptive and does not change the objective reality.

Unless otherwise proved, Gofman's view, that nuclear power is incompatible with indefinite sustenance and perpetuation of life on earth in time, may so depressing, frightening, horrifying, but certainly not preposterous. There is no way in which radioactivity can be prevented from doing the damage, nor is there any way in which increasing quantities of radioactive waste can be isolated for long periods. The only good news I am aware of is the work of Donald Cram, Charles Pederson and Jean-Marie Pierre Lehn in supermolecular chemistry. Their work raises hope of separating radioactive tissues *from* normal tissues in individuals exposed to radiation. But firstly, it is philosophically wrong to escape through hope and secondly, whereas ill effects of nuclear radiation will be freely available to all in the neighbourhood of a nuclear plant, the supermolecular chemical treatment could be afforded only by some, who would not be residing near the nuclear plant, in the first place. That is a general law of the distribution of "goods" and "bads" in the society. "Medicines are proprietary, but germs are free", Schelling had said. Therefore, to rely on distant hopes of supermolecular chemistry as an antidote to the malady freely dispensed by the nuclear radiation amounts to sacrificing some individuals for the benefit of others, or in other words, regarding some men as means. This is not in consonance with the modern (or even ancient) theories of justice such as Rawls's. I have an impression that here Shri Sastry agrees with me.

I have adequately mentioned that the density of pollutants gets diluted by convection and the biological concentration does act on these diluted pollutants. But it nevertheless docs ample harm. Aquatic life and through multiply linked trophic chains **all** other life forms do suffer the damage. **That** most countries have, at least officially, given up discharging nuclear waste in the large water bodies, is proof enough that dilution due to convection currents is not an adequate safeguard.

I must apologize for citing DDT am! radionuclides side by side. That is unfair to DDT. It is a chemical and could be chemically decomposed in to nontoxic substances and therefore the problem posed by DDT can have a technical solution. Radionuclides cannot be neutralized thus. I had agested geophysical studies of the proposed nuclear waste disposal sites because I believe that such studies would prove that these proposals are untenable, as happened in the U.S. I am glad that Shri Sastry welcomes such exhaustive geophysical studies.

I must thank Shri Sastry for giving im this opportunity of offering amplification of my views.

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FUDGING THE ISSUE

The Truth About "Safe" Background Radiation

AMONG the most important dogmas held by the nuclear establishment worldwide is that "background radiation"—i.e. radiation from the earth and space (in the form of cosmic-rays), as well as from food, airplanes and machines, to which people everywhere are subjected—is safe. At least, it has not been known to cause any health damage, say the nuclear pundits.

This proposition is of critical importance in setting the "safe" or "maximum permissible" limits for radiation exposure of human subjects from mail-made sources, such as nuclear power stations and other atomic installations. The argument is that if background radiation (usually of the order of 100 to 150 millirem per annum) cannot cause any harm, then a little additional dose of ionising radiation from nuclear installations cannot damage the health of the normal population either.

That is how, in practice, the exposure limits (currently of the order of 500 millirem a year) are set for the ordinary people (as distinct from specialised radiation workers) who may live close to nuclear installations and face the potential risk of becoming their victims. That is how people who ought not to be exposed to any additional radiation at all arc asked to bear an extra dose of it , which they are told will not harm them in any way. Indeed, some scientists of BARC have even gone to the preposterous length of claiming that low doses of radiation may actually be beneficial !

There is growing evidence that the original dogma on which this self-serving inference is based is as false and pernicious as the conclusion itself. Studies from Australia and southern Africa suggest that "natural" Kickground radiation—like all ionising radiation in any form or dose -is harmful.

Of particular significance is a 1976 Indian study, remarkable at least partly because it was conducted by researchers of the prestigious All India Institute *of* Medical Sciences, New Delhi, which has devastating results as far as the nuclear industry's pet predilection about background radiation goes.

Published in *Nature*, the study was conducted by N. Kochupillai, I.C. Veima, M. S. Grewal and V. Ramalingaswamy in the coastal villages of Chevara-Noendakara in Kerala and Manavalankurichi in Tamil Nadu, which have high background radiation levels thanks to the presence of thorium-bearing monazite in the beech sands. It concludes that the prevalence of Down's Syndrome (or Mongolism, caused by a genetic abnormality) in the study population was significantly higher than in a comparable ("control") population which, however, lives under normal background radiation.

The Kochupillai study jolted the nuclear establishment throughout the world : while the prevalence of Down's Syndrome and severe mental retardation with physical abnormalities was only 0.17 per 1,000 in the control group, it was more than five times higher or 0.93 in the study groups. Hence background radiation at Chevara-Neendakara, variously estimated at between 342 millirems a year (BARC) and 1,500 millirems a year (WHO) must be considered definitely harmful. The nuclear industry's dogma thus falls to pieces.

The industry retaliated in the form of a reply by K. Sundaram (of none other than BARG), which contested some assumptions in the study pertaining to thortality and fertility age structure of the population. Sundaram estimated the frequency of Down's Syndrome in the "normal" population on the basis of certain western models and showed that the high frequency found in the study was not (statistically speaking) significantly higher.

The AI1MS group published a rejoinder to Sundaram, questioning some of his assumptions and conclusions on the ground that he had failed to consider the likelihood that if the infant and childhood mortality in India is about six times higher than in the West, the mortality of Down's Syndrome would also be substantially higher than *in* the West. If the higher mortality of Down's Syndrome is taken into account, then their original conclusion stands.

The debate thus ended with the substance of the Kochupillai study hypothesis remaining uncontested. But now, V.T. Padmanabhan, the author of two remarkable studies on the Indian Rare Earths plant in Kerala, has published a superb analysis of the entire debate. ("Radiation-Caused Genetic Diseases at Chavara-Neendakara in Kerala India : the Anatomy of a Non-Debate": in *International Perspectives in Public Health*, Vol-3, Issue 1, Spring 1987, pp. 20-25).

He shows that neither of the two contestants had taken into account the peculiarities of the area they had studied, viz. the low mortality rates in Kerala in relation to the country as a whole, the significant differences *within* Kerala between the lowlands (where the monazite sand belt is located) and the mid and highlands.

Padmanabhan brings to bear ou this analysis his knowledge of the state and his rich insights into its distinctive socio-economic features such as the fishing economy of Neendakara, the site of an Indo-Norwegian project for mechanised trawler-based fishing, the relatively advanced status of the health-care facilities in the village, and so on.

After a masterly analysis of the mortality, fertility and genetic abnormality rates in the study and control groups, he concludes that the Kochupillai team had *underestimated* the damage caused by exposure to radiation from the monazite sands. The frequency of Down's Syndrome at Chavara-Neendakara, he shows, is five times higher than in Trivandrumand in the country as a whole (excluding Madras) and as many as 16 tunes higher than iu Madras.

Padmanabhan's work has thus demolished the bogus assumptions and dogmas o£ the nuclear industry once and for all.

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RADIATION FACTS

Many Friends have said that Anumukti is getting too technical and is not for the uninitiated. From now on we will have a page for just that.

The type of radiation emitted from nuclear power facilities is called ionizing radiation ; it has the energy needed to remove one or more electrons from an atom. The ionization of an atom creates an ion which is chemically reactive and can damage living tissue. Ionizing radiation includes X rays, gamma rays and alpha, beta, and neutron radiation. Cosmic radiation and naturally occurring radionuclides (radioactive elements) such as uranium, radium and thorium all emit ionizing radiation referred to as natural background radiation. Ionizing radiation is also the type used in medical X-rays, and the type found in atomic weapons fallout and all phases of the nuclear fuel cycle from mining and milling to waste storage. The radionuclides are unstable and eventually decay through a decay chain to a stable element. Radiation is emitted during this process. The half life of a radionuclide refers to the time necessary for one-half of a given amount of it to decay.

When radiation strikes a person, one of four events may occur :

i) it may pass through the cell without causing any damage;
2) it may damage the cell, but the damage may be repaired;
3) it may damage the cell, but the cell may divide before being repaired;
4) it may kill the cell.

The last, two events are of concern to human health. Ce Killing is often harmless unless enough cells in a particular tissue are killed, rendering it incapable of functioning. Medical radiation therapy uses the cell-killing effect *of* radiation to kill cancerous cells. The third effect, incompletely or incorrectly repaired cell damage, may eventually result in delayed health effects such as cancer or be passed on to future generations as a genetic defect.

Total body radiation involves the exposure of all organs. Gamma radiation is the most highly penetrating form and creates, the most damage as it passes through the body. This is also true of X rays and neutron radiation. Alpha and beta radiation, which have low energies are not serious external threats, but if ingested or inhaled they are extremely harmful to the organs or tissues in which they lodge.

The most common measurements of human radiation exposures are rads and rems. Both refer to the actual amount of radiation absorbed by the body. The rem is a more precise measurement of the actual biological damage done. Because the rem is an inconveniently large unit for radiation protection purposes, doses are often expressed in millirem (mrem). One rem equals one thousand millirem. When referring to the collective dose received by a certain population the dose is generally expressed in man-rems. This is calculated by multiplying the total number of people exposed times their average individual dose. For example, 10,000 man-rems is the dose received by 5,000 persons each exposed to 2 rems, or by 10,000 persons each exposed to one rem, or by 20,000 persons each exposed to 500 mrem. Current guidelines recommend the general public receive no more than 500 mrem per year.

Inside the human body, many radioisotopes are concentrated in a specific organ, meaning that most effects of the radiation are concentrated into a small area.

Radiation emitted from nuclear power plants occurs in the form of several radioisotopes. Routine operation of a nuclear reactor includes occasional releases of radionuclides that have built up within the reactor system. Some of the isotopes routinely released are tritium (radioactive hydrogen), iodine-131 which has a half-life of eight days, noble gasses (argon, xenon, and krypton), cobalt-60 which has a half-life of five years, strontium 90 which has a half-life of 28.5 years, and cesium-137 with a half-life of 30 years.

Noble gases are inert, meaning they do not chemically interact with the body. but they are capable of decaying to elements which are not inert and are concentrated in the body. For example, xenon can decay to isotopes of barium, cerium, and cesium; and krypton can decay to strontium and yutrium.

Once radiation has been released it is dispersed by the wind and is brought down by gravity, rain, snow and fog. If winds are calm the radiation will just deposit near the base of the stack. If the radiation drifts over a city where it is raining most of the radiation would be deposited there.

After radionuclides reach the ground they can be absorbed by plants and people. It is possible to receive direct radiation from the nuclides at ground level and to receive a radiation dose through the inhalation or ingestion of contaminated materials. Many plants and animals which are important human food sources are known to concentrate several radionuclides. For example, iodine is concentrated in milk; strontium is concentrated in milk, root vegetables and animals.

Many types of cancer are known to result from radiation. The most common type is leukemia, but recent studies have shown that bone marrow and soft tissues like the pancreas, brain, kidney, lung, and large intestine also develop radiation induced cancers.

Protest in Russia

In respvise to pressure from local residents, Soviet authorities have halted the construction of a nuclear power plant in Krasnodar, north of the Caucasius mountains, near the Black Sea. This news was reported in the paper Komosomolskaja Pravda on 27th .January 1988, which also stated that there is bitter, opposition to most of the nuclear plants under construction, as well as to those alredy in operation. These announcements arc the strongest acknowledgement yet that there is strong public opposition to nuclear energy in the USSR.

Before the Chernobyl accident, when it was considered prestigious and profitable to have a nuke in your neighbourhood, the local authorities in Krasnodar requested a nuclear plant in their area to make up an anticipated shortfall of energy in the northern Caucasius. However, after Chernobyl attitudes changed rapidly. Twenty-five million Roubles had already been spent on construction of the Krasnodar plant when the local officials gave in to public pressure and cancelled it.

This is the first time that opposition has actually halted construction of a nuclear plant in Russia. Public concern has lead to the suspension of work at another power station near the town of Clugrin in the central Ukraine.

The development of open opposition to nuclear energy also points to the growing power of public opinion in Soviet politics. In the past intellectuals had been known to express their opinions to the leadership on important issues. Until recently, however newspapers would rarely give such opoinions space if they contradicted the official viewpoint.

A backlash against nuclear energy would create a serious dilemma for the Soviet leadership, which is basing much of its development plans on the assumption that nuclear energy will play an increasing role in supplying power. At present, there are plans to build six new 1000 Mw reactors in the Ukraine, each of which would be based at one of the seven existing power stations in the republic. In some cases the result would be a group of reactors at a single site producing up to 6ooo MW of electricity. A recent review carried out by various institutes of the USSR snd the Ukrainian Academics of Science had reached the conclusion that no nuclear power stations execding a total output of 4000 MW should be built. The option of opening new sites is slowly being foreclosed by growing public opposition. The authorities would be better advised in giving up their fascination for nuclear power, rather than in digging the foundations of a deeper tragedy in the future by making the existing power stations too large and unwieldly.

Sources : *WISE News Communique* : 287.2912
Christian Science Monitor : February 14th,

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Subscriptions, donations, enquiries regarding circulation etc. should be addressed to:
Editor Anumukti,
Sampoorna Kranti Vidyalaya,
Vedchhi, Via Valod,
District: Surat 394 641.
Editor: Surendra Gadekar
Printed at:
Bhargava Bhushan Press, Varanasi.-5/4-88

PRINTED MATTER BOOK POST
1988

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol. 1 No. 6 **June 1988**

Some say the world will end in fire,
Some say in ice.
From what I've tasted of desire
J hold with those who favour fire.
But if it had to perish twice,
I think 1 know enough of hate
To say that for destruction ice
Is also great
And would suffice.

Fire and Ice. *Robert frost*

Dua, my daughter, is five years old. She radiates joy and the last five years have certainly been amongst the happiest of my life. But sometimes I feel it is a dream with the external world rudely knocking to shake me out of this idyllic state.

The reality outside is harsh. The horrors of nuclear holocaust are just a button-push away. But even without that ultimate fire, scientists estimate that more species of flora and fauna shall become extinct within our lifetimes than have done so in the last fifty million years together. The last great miss extinction was sixtyfive million years ago when dinosaurs and rainy other species made their exit. Even that mass extinction, which torn; speculate was caused by the impact of a large meteorite on earth which raised a lot of dust and completely changed weather patterns, did not bring such sudden death. The lifetime of a species ranges over hundreds of thousands to millions of years. A century is like the proverbial blinking of an eyelid. Yet we have managed to poison our planet to such an incredible extent in this short time that hundreds of species will be becoming extinct everyday. The much heralded dawn of the 21st century is a time of doom for a lot of our fellow beings. The Greenhouse effect, Acid rain, 'Ozone hole, Soil erosion, Deforestation and Desertification, Radioactive and Toxic waste are just a few signboards on this route to global catastrophe. Our own local hells - terrorism and (en)counter state repression,-Punjab and the northeast-hegemonistic adventurism in Srilanka, never ending violence against adivasis, harijans, minorities and women -endemic starvation ni Kalahandi and the deepening drought in Gujarat, etc seem like eddies In this flood towards doom.

Our very existence today depends on the products of modern industrial processes. All these processes have two common characteristics : they guzzle limited resources and they produce ever-growing wastes. Even if we confine ourselves to energy generation alone, all forms of bulk' production, coal oil, nuclear and large dams arc both hazardous and polluting. The coal versus nuclear controversy, so dear to energy planners, is akin to condemned prisoners on death row expressing a preferrence for the electric chair over the gas chamber. We need a way out which affirms life rather than death.

In *'A Study of History",* Toynbee noted that civilizations decine when they fail to find adequate responses to the challenges that face them. The recurrent and ever virulent problems that confront us only attest to the bankruptcy of the universally adopted modern materialism. The touching faith in the ability of SCIENCE to solve all the problems it has spawned needs to be recognised for the superstition it is. It is only when we realize that we have reached a dead end, that we can begin the search for a way out.

Wherein lie reasons for hope ? Hope lies in the spread of ecological consciousness in the young. It lies in the recognition that humans are not the "centre of all meaning and the source of all value"-that material consumption is not what being human is all about. Hope lies in the vision of Gandhi, of Tolstoy, of Thoreau and Emerson - a world in which all creation can live together in peace and respect.

As long as we remain convinced that we arc the measure of all that is, that the world is a mere store of resources for gratifying our whims, there is no alternative to fire and ice - a very apt metaphor for nuclear winter. All our Duas (an arabic word meaning both prayer and blessings) deserve better.

Surendra Gadekar

American Nuclear Resistance—1987

The number of arrests for anti-nuclear civil disobediance in the United States and Canada increased in 1987 by nearly 60 % over recent years to a total of over 5,300. Statistics compiled annually by the Nuclear Resister newsletter show that the current figure equals the record number of arrests reported in 1983, the year of Euromissile deployment and massive demonstrations in the United States and Europe.

Most of these arrests were weapons related and occurred at military facilities, war contractors and federal government offices. About 400 of the total were of people protesting nuclear power, uranium mining and related projects.

As a consequence of these arrests, over 120 people served or are serving prison sentences ranging from two weeks to 17 years. Hundreds more served lesser sentences.

Action groups all across the continent, some in loose coalition with others, but for the most part acting independently, engaged in over 180 separate actions in 1987 at more than 70 different sites. (Of the total arrests, 95 were reported from Canada, during nine actions at three sites.)

The Nuclear Resister newsletter, edited and published eight times each year in Tucson, Arizona, by Jack and Felice Cohen-Joppa, is a source for comprehensive information about anti-nuclear civil disobedience in the United States and Canada. Subscriptions are $15/10 *issues from the Nuclear Resister, P.O.Box* 43383, *Tucson, AZ* 85733 *U.S.A.*

ANUMUKTI DAY-1988

KARNATAKA

Chernobyl day was commemorated in Karnataka as 'Anumukti' day. The emphasis was on educational and cultural activities. A group of ten activists who had met for a preparatory meeting beforehand felt that an impasse had been reached with conventional forms of protest, especially marches to the chief mi listers residence and that something novel needed to be done to capture the imagination of youth.

For the programme in Bangalore, a number of different groups cooperated and worked together as a unit. Amongst these were CIEDS collective, Prarambha, Samagra Vikas, and the Progressive Youth Centre. A number of activists observed a one day fast as an expression of commitment to the anti-nuclear cause. The programme was formally inaugurated at 8 AM at Minsk Square by the exhibition of black and white sketches of Shri B.K.S. Varma. A workshop was conducted by the group Media Exploration for Social and Cultural Advancement (MESCA). In the workshop, ways of fabricating Demon Heads were demonstrated. These demonheads were later used in a procession in the evening. Activists of Bingalore are specially thankful to Shri Shashi Adappa and Shri Rajendra of MESCA for their help.

About 4 PM in the evening, mask wearing and slogan shouting activists of the progressive Youth Centre (PYC) commenced a cycle rally. Taey went to different parts of the city and distributed anti-nuclear literature.

Throughout the day a group of three singers who had come specially from Raichur to participate in the programme, sang songs describing the damage done by the destruction of the Kaiga forest. The songs which were based on Kannada folk tunes were much appreciated. A lot of people cams forward and expressed their solidarity with the activists. A lot of posters were punted and exhibited. There was a magic show by Raaj the magician.

At 5.30 in the evening there was a protest march by about 250 protesters. The protesters were holding banners, posters, placards and demon-heads. Others formed a human chain, from Miask square to Cubbon Park Bandstand. Later in the evening the rally converted itself into a meeting. There was an impromptu performance of Yakshagana on the subject of Nuclear Demon. Besides there was a folk song and dance performance by the group from Raichur and some PYC activists. The meeting was addressed, among others by Shri H.S. Doreswamy, Dr.Ramachandra Guha, Dr.Nagaraja Rao and Shri Suresh Heblikar.

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ANDHRA PRADESH

Citizens against Pollution (CAP) has decided to launch a protest campaign against the siting of a nuclear power station near the Nagarjunasagar dam. The campaign will concentrate on the command area of the dam on the Krishna river.

Mr.K.Purushottam Reddy, a college professor in Hyderabad, and the president of CAP told a news conference that an anti-pollution 'Prachar Ratham' (propoganda chariot) would tour the area fron Nagarjunasagar to Khammam as well as Vijaywada and Guntur, to spread awareness amongst the people of the dangers of radioactive contamination.

At the same time a group of lawyers had come forward to file a public interest petition in the high court to prevent the nuclear power board from going ahead with the project.

Prof.T.Shivaji, of the Andhra university, told newsmen that atomic energy officials "are taking us all for a ride" and not following known safety rules including those laid down by the atomic energy commission itself.

Prof. Shivaji said that the Nagarjunasagar project did not men stipulated criterion. Vijaypuri, a township of 40,000 was within 16 Km, of the site. The tiger sanctury, the historical museum of ancient Buddhist monuments of Nagarjunakonda, tourist centre and the Sagar lake with abandant fish, all lay in close proximity of the reactor site. He said the nuclear plant would discharge 3000 million gallons of hot condensor cooling water at a temperature ten degrees Celsius higher than the ambient temperature of the river water. Due to this massive discharge, there will be drastic reduction in the oxygen content of the river which would result in high mortality in the fish.

Times of India : April 28, 1988

GUJARAT

Kakrapar, in south Gujarat, is the site of two 235 MW reactors under construction. The construction began in 1980 and at present the authorities expect the reactors to become critical sometime in 1991. As regular readers of *Anumukti* would be well aware, a local agitation of somewhat sporadic character has been going on since 1985 opposing the construction of the reactors.

For quite sometime past activists had felt the lack of statewide support for the Kakrapar agitation. This lack was attributed to the fact that no campaign on a statewide basis had been conducted to educate the people about the hazards of and the inequity and the injustice involved in the nuclear enterprise.

At the last meeting of Gujarat Anu Urja Jagruti, it was decided to observe Chernobyl day by having a march from Kakrapar to the state capital at Gandhinagar - a distance of around 400 Km. (Sec *Anumukti* vol.I No.5) Originally the idea was to travel the whole distance in a bus with programmes of public meetings, poster exhibitions, video shows, etc on the way, but a suggestion from the students of Sampoorna Kranti Vidyalaya, made for a happy change in the programme. They concieved the idea of a cycle rally for the whole distance. There were some logistic problems in this, but in retrospect, the cycle rally turned out to be the major component in the success of the whole venture.

The march started from Kakrapar on the 19th of April and proceeded to Gandhinagar with halts at Bardoli, Surat, Ankaleshwar, Bharuch, Baroda, Anand, Nadiad and Ahemedabid. Besides eleven cyclists, there were eleven others who covered the distance using state transport buses, trains and in the latter part of the journey, a jeep.

Public response to the rally was very encouraging. The cyclists who carried posters and wrote slogans on the road-side were often cheered and received enthusiastic welcome in many villages. Some roadside cycle repairers even refused payment for the repairs carried out by them saying that they too wanted to be part of the march. During the march, thousands of handbills were distributed. A lot of copies of two antinuclear booklets in Gujarati were sold and *Anumukti* has 21 new subscribers.

The three press conferences held at Surat, Baroda and Ahemedabad were well attended and the issue was extensively reported in both the Gujarati as well as English newspapers. Most of the leading Gujarati papers had editorials which commented favourably both on the anti-nuclear stand as well as on the way the rally was conducted, contrasting it with the fake 'Dandi March' indulged in by the Prime minister just a few days previously. The march was also mentioned prominently in local radio and TV news bulletins.

On the 26th of April the march concluded by submitting a memorandum to both the governer and the chief minister of Gujarat at Gandhinagar. The demands in the memorandum were : 1) That a national debate be conducted at various levels so that a national consensus can be established on nuclear activities in the country, 2) Till such a consensus was established, there be a moratorium on new plant construction and 3) Information regarding nuclear activities be made freely available to citizens and the cloak of secrecy surrounding them be lifted. The chief minister expressed his inability to do anything about the demands since atomic policy was decided in Delhi but agreed to convey the demands to the Prime minister.

As part of the next phase of the programme, a necessity was felt of preparing a number of small (32 pages) booklets highlighting different aspects of the nuclear issue in Gujarati and Hindi. Also special efforts need to be made to contact different amateur theatretical groups to stage plays on anti-nuclear themes.

Surendra Gadekar

An Appeal

A large part of the milk distributed by the urban dairies in Bombay, Calcutta, Delhi and other cities in India is likely to be radioactively polluted. Our National Dairy Development Board, a Government of India organisation, has contracted for imports of 75,000 tonnes of milk powder and 2$,ooo tonnes of butter oil from European Economic Community (EEC) countries and a part of this consignment is expected during the ensucing months. The EEC exports of dairy products, since Chernobyl atomic disaster in April 1986 were found radioactively polluted and millions of kilos of milk powder, butter oil, etc were rejected by Afro-Asian Countries including Phillipines, Malaysis, Singapure, Sri Lanka, Bangladesh, Pakistan, Nepal, Angola, Ethiopia, Ghana, Mozambique, Somalia and others. But India has been a sole exception. India does not have a compulsory statutory check for detecting radioactivity in foodstuffs at its ports of entry, though our Bhabha Atomic Research Centre (BARC) carries out such tests if and when a sample is sent to them. However, BARC has failed to enforce any scientific statistical design of sampling and in most instances the representative character of the sample vis-a-vis the imported consignment is in serious doubt. Nevertheless BARC have issued certificates regarding its fitness for human consumption.

We therefore approached the Supreme Court and petitioned for a restraint and ban on imports of such dairy products from EEC countries. But Government institutions and Government Scientists opposed our petition and Supreme Court rejected our plea despite advice and warnings about genetic damage and cancer from Nebel Laureates, Dr. Linus Pauling and Dr. Geroge Wald. The conscience of the nation has been shocked by this callous attitude of the Government towards public health hazards. Numerous consumer associations have requested the Supreme Court to reconsider its decision and we have filed a Review Petition. We have also requested the Prime Minister to intervene and stop imports immediately. The former Chief Justice of India, Mr. Y. V. Chandrachud has called the Supreme Court verdict a monumental error. In the British Parliament, fiftynine oposition MPs have given a Notice of Motion for investigation to ensure that no radioactive foodstuff will be shipped from UK to the Third World countries or from European countries to UK. In Khatmandu, Nepal, widespread consumer resistance has disrupted the distribution of recombined milk by government dairies.

Consumers health is in danger. Infants, children and pregnant women will be the worst sufferers. Future generations too may suffer from genetic damage and higher risk of cancer. We, therefore, urge upon you to act now and force the Government to ban imports of all milk products from EEC countries. People must raise their voice and assert at all public forums to stop the import and distribution of radioactively polluted milk products in India.

Maharashtra State Government Employces' Confederation.

Chernobyl in PM's Kitchen

Rumours claim that Motilal Nehru, our present Prime minister's great grand father used to get his laundry done in Paris. I never gave credence to these rumours till I read the following story in the Indian Post of April 26th, 1988. *We are reproducing it for its surreal quality and the light it throws on the extravagance of our rulers.*

A few hand-picked ' scientists in the employ of the Department of Atomic Energy have been entrusted the special responsibility of testing for radioactivity, the food consumed by Rajiv Gandhi and other VVIPs.

Armed with a string of university degrees and gamma spectrometers, they probe deeply into the Prime Minister's food to ward off nasty maladies that could arise from Chernobyl's malignant isotopes.

The list of people they protect is select, an exclusive club which includes the Prime

Minister, the President and the Vice-President and their immediate families. Any morsel in their list of edibles that originates from countries affected., even remotely with the Chernobyl fallout, is scanned by powerful radioactivity monitors at the Bhabha Atomic Research Centre here.

For the last 18 months, they have seen, inspected and passed every edible item consumed by the Prime Minister originating from Europe. And in the instances when they have not been able to cart the food to their laboratories, the scientists have jet-hopped continents chasing VIP food.

The exercise began shortly after the Chernobyl nuclear disaster when the Director-Gsicral of Health Services in New Delhi sensed dinger to the PM's health and issued a directive that all food coming from Europe and reaching Rajiv Gandhi's plate be first tested for radioactive isotope Cesium-137.

Since then, the PM's food has been taking a long and winding route. After its flight from the West to New Delhi, a portion is selected as the Prime Minister's feed for the next week to fit a menu attested to by his kitchen staff. The food, comprising meat, bread, select vegetables and even chocolate and cookies, is then packed into 500-gm pickets and flown to Bombay, and from the airport here, brought by special escort to BARC's testing laboratories for priority analysis.

The samples are checked, cross-checked and then verified by a head of department before a copy of the report is sent to the Director General of Health Services, and the food returned to New Delhi.

And when the PM leaves the country, the food leaves with him. In fact, for every kilometre he travels out of India, his food would have traversed more than twice that distance.

For the BARC laboratory, which receives about 2-3 kg every 15 days while the PM is in the country, the real task begins when he is set to tour the world. The Director-General's office had initially toyed with the idea of testing only the PM and his family's food, but decided against it because of the possibility of the untested portion landing on his plate, and the 'safe' special meal going to some inconsequential bureaucrat or journalist.

So the lab has to test all the food that enters Gandhi's special Jumbo aircraft. Which means that about 12-15 kg of samples arrive in Bombay about 3-5 days prior to the journey for Cesium-137 testing.

Incidentally, BARC has seldom performed similar tests for general consumer products, the one exception being that for the imported butter. Other items purchased from Europe, including meat, special seasonal vegetables and even the assortment of chocolates available here for general consumption, do not go through any isotope-test.

DAE scientists say the tests arc not necessary any m>rc as radioactivity levels are dropping. Now they stand at 3 becquerels per kg against the permissible limit of 40 becquerels. And how long would they continue the test ? "Till he Director-General issues a fresh directive."

Courtsey : R.S. Venkatesh, Indian Post.

Heavy Water Theft

Norway has confirmed persistent reports in the press that in 1983 consignments of Norwegian heavy water were diverted and sold in the international black market. Investigations arc still continuing but reports speak of at least two separate consignments of 15 tonnes each which were hijacked from W. Germany and Roumania. India has been mentioned as one of the possible recipients of these stolen goods. It is difficult for the Indian Atomic Energy establishment to deny these allegations since in 1983 India was desperately searching for heavy water to start the first unit of the Kalpakkam reactor (MAPS-I) near Madras.

The Kalpakkam reactor had been completed in 1980 and was not being started mainly due to a shortage of heavy water. The requirement tor a plant of its type and size is around 250 tons for start-up and about 20 tons per year thereafter. India does have a number of heavy water plants of its own but their performance has never been anything other than poor. (See the story on the Tuticorin heavy water plant in this issue). The Tuticorin (67 tons/year) and Baroda (70 tons/year) plants were then (and have been since) in constant trouble. (Only recently the Baroda plant had a big fire). The Talcher (67 tons/year) has never got off the ground. The old Nangal (14 tons/year) plant was at the time not producing up to capacity due to frequent power cuts in the region.

Thus, the main question remains : how did India manage to get the 250 tons of heavy water to start MAPS-I reactor when all its heavy water units were non-performers ? The establishments answer to the question has been to ignore the question altogether, put up a bold front by claiming that India used its own heavy water. The annual reports of the establishment which used to be more open on the performance of the heavy water plants, suddenly became more restrained and less communicative. This was also the time when, within the establishment, the heavy water directorate under Dr.N.Srinivasan was facing rough weather and a running battle between Dr. H. Sethna, Dr. Raja Ramanna and Dr. N.Srinivasan ultimately led to the latter's exit. The only answer the establishment has given to the charges is that it had adequate heavy water from the small levels of output of the Tuticorin and Baroda plants over the years 1978-1982 to build up enough stocks to run the MAPP-I unit. However the quantity has not been disclosed beyond saying that the unit needed 250 tons. Outside observers have speculated that India bought heavy water clandestinely on the international black market since this commodity was very much for sale following a glut in its production abroad. Others have alleged that India diverted heavy water from the non-working RAPS-I unit in Rajasthan, without anyone coming to know about it, under the guise of upgrading the heavy water.

One option which was open to India at the time, was to openly import heavy water from the Soviet Union as was done in the case of RAPS-2 unit. However, any open import would have meant full cope inspections by inspectors of the International Atomic Energy Agency (IAEA). This would have meant very close tabs being kept on the Plutonium produced at the reactor. To a country engaged in "keeping the nuclear option open" this was totally unacceptable. Smuggling and stealing was considered preferable.

The nuclear power target of 10,000 M\V by the year 2000 also depends heavily on the success of the new set of heavy water plants coming up. Tuticorin and Baroda plants were set up with forign technology. The subsequent plants have been based on indigenous developments. The hydrogen sulphide water exchange process demonstrated successfully at Kota has provided a method of setting up heavy water plants without depending upon the undertain supplies of synthetic gas from fertiliser plants. The only drawback at Kota was the poor supply of process steam from the nuclear power plant. This is being corrected in the subsequent design of such plants like the one at Manuguru.

The capacity of the new plants is also somewhat highcr-130 to 200 tons per year. To fulfil this targer of 10,000 Mw a capacity of 13000 tons of heavy water would need to be built up. The establishment own feeling is that all the 'teething' troubles of heavy water production are now over and the country is well on its way to self suffiency. In case this confidence turns out to be unjustifed, well, the international black market beckons.

Sources : Heavy Water Politics Runs Deep-
Rajendra Prabhu Hindustan Tunes
15.5/88

New York Times : 8.5/88

LETTER BOX

Nobody Wrote

The Perils of Tritium

Tritium is an extremely' paradoxical and dangerous material. On the one hand, it is a key material in hydrogen bombs and is produced in highly concentrated forms in special military reactors; on the other hand, tritium is generated as a waste product in nuclear power plants and is released to the environment as there are no financially viable techniques for separating it from effluents.

The nuclear establishment has always propagated the view that Tritium is one of the least hazardous forms of radioactive waste, thus justifying massive releases to the enviroment. The truth of the matter though, is that the retrieval of tritium from waste streams is costly and would cripple the nuclear industry financially. As a consequence, the enormous body of scientific evidence disproving low toxicity claims for tritium is callously brushed aside.

Tritium (T) is the heaviest isotope of hydrogen. It is formed naturally in the atmosphere by the action of cosmic rays. About 1.8 to 2 million Curies (MCi) are formed every year, (a Curie (ci) is an unit to measure radioactivity. It is the activity of 1 gm. of radium and corresponds to 3.7×10^{10} disintegrations every second). The total glogal inventry due to natural causes is around 36 MCi. Tritium is a 'beta emitter with a half-life of 12.35 years. As an isotope of the lightest element, gaseous tritium reality diffuses through most materials, including steel and rock.

Today natural production of tritium is vastly overshadowed by nun's nuclear activities. On a worldwide scale, the atmospheric testing of nuclear weapons between 1945 and 1962 is still probably the predominant source of environmental tritium. During this period between 6800 to 8000 MCi were released into the biosphere. It will take until the middle of the next century before this tritium has decayed to a level equal to the natural global inventory.

The scale of, the present day tritium discharges is a cause for still greater concern, however, in the sense that we have no say over history. The amount of tritium being released to the environment today on a routine basis greatly exceeds natural production and is increasing every year. Discharges are mainly in the form of tritiated water (HTO) or tritium gas (HT_2 or T_2). Because tritiated water is of chemically identical to 'normal' water (H_2O), tritium constitutes a unique environmental contaminant : unlike other radioactive and chemical pollutants, suspended or dissolved in the water body, tritium contaminates the actual water molecule. There arc no financially viable means of removing tritium from effluents - or drinking water-ana the radioactive HTO streams into exactly the same bilolgical pathways as H_20, entering all living organisms and thus gaining access to metabolic and genetic processes.

The main sources of environmental tritium today can be summerized as follows : the civilian nuclear fuel 'cycle', involving power reactors, waste storage and reprocessing facilities; the military fuel 'cycle' of the five permanent members of the UN security council, involving specialized reactors for plutonium and tritium production, propulsion reactors for nuclear submarines and surface vessels, reprocessing plants, weapons plants and waste dumps; nuclear R&D establishments, comprising laboratories, test reactors and fusion research centres; miscellaneous civil applications, for example, luminous paints, 'starters' for fluorescent lighting, gas chromatographs, tracing materials (oil and gas exploration, hydrological studies) and medical applications as well as current nuclear weapons testing programmes and weapons sites.

Editors comment :We in India need to take special notice of tritium since the Indian nuclear programme is based primarily on CANDU type of reactors. Generating just 1000 MW of electricity in a CANDU also means producing 2.4 MCi of tritium. Thus, if our current plans of producing 10,000 MW by the year 2000 do materialize, we would usher in the new century producing 12 to 13 times the total 'natural tritium production. Around 400,000 Ci of this huge pile would be discharged to the atmosphere in the natural (no accidents) course, every year after a few years of reactor operation. In case of any accident; massive amounts of tritium would comaounatc the environment and produce a substantial impact.

Besides the tritium released by the reactors, reprocessing of the fuel elements to recover plutonium would mean additional substantial releases.)

Tritium Toxicology

An overwhelming body of evidence reported in scientific journals deals specifically with the perils of tritium. However, ICRP (International Commision for Radiological Protection) recommendations 26 and 30, (the latter dealing specifically with tritium) are in contradiction to this evidence. As has often been said, legislation on radiological protection serves to protect the nuclear industry rather than its victims.

In the following we shall briefly summarize the evidence on tritium.

1) Tritium intake by the human organism is not limited to HTO. Because tritium is also assimilated in various forms by plants and animals, human food is also contaminated. (Gi 76, Ki 82)

2) Tritium assimilated from HTO by plants and animals is not only retained in cell fluids but is also, in the course of metabolic processing, assimilated in all sorts of biochemic molecules. This organically bound tritium (OBT) has the capacity to cause much greater biological damage than HTO. For instance, in their tritiated forms, luccine (a protein precursor), uridine (RNA precursor)and thymidine (DNA precursor) are; respectivly, approximately 10, 100, and 1000 times more toxic than HTO (Ry 79). In the case of newly formed cmoroyos, T-thymidine is 5000 times as damaging as HTO (Ya 94.). This *is* because OBT is better 'embedded' biochemically in the organism and hence has a far longer biological half-life, than HTO : between 400 and 600 days, as compared with 10 days for HTO (C_2 8_4). ICRP 30 chooses to neglect the effects of OBT and bases its recommenations on a biological halflife of 10 days for all 'tritium. "(Biological half-life is the time elapsed before half the absorbed tritium is eliminated from the body by natural processes).

3) In the tissues of animals consuming tritiated water, the ratio of hydrogen to tritium atoms in . OBT is two to eight times higher than that in body water (K_2 77. Za 79). This is extremely relevent when considering contamination of food with tritium, and also when assessing incorporation of tritium into our own bodies.

4) Tritium accumulates on an organ specific basis, especially in the ovaries and the testics. This effect is reinforced if tritium intake is in the form of OBT, i. c. tritiated food (Pi 82). ICRP 30 assumes that tritium is uniformly distributed in among the soft tissue.

5) Tritiated molecules are passed on to growing embroyos across the placental barrier. Experiments have demonstrated that, from generation to generation, the specific activity of OBT in various organs increases, especially in the ovaries (Pi 82). The highest specific activity is observed in the DNA fraction, and the weight of the brain and the genital tract organs is decreased (Za 79). Offspring arc found to have a decreased number of primary oocytes (Do 79a) (Oocytes are ovary 'Preamers'. At birth, all female mammals have a limited but sufficient store of such cells, which develop into fully fledged ovaries later in life. Primary oocytes are formed only during embryonic development.)

6) Virtually all the experimental work on radiotoxicology of tritium has been performed on rodents. However, Dobson (Do 79a) has shown that monkeys arc considerably more sensitive than mice - particularly as regards damage to primary oocytes.

7) Experimental microdosimetry of such low energy beta-emitters as T is difficult. Mathematical models are being used to perform dose calculations (Co 82, Jo 84). These models locus only on the energetic aspects and miss many biological effects. in the case of tritium decay at least three factors are involved : a) transmutation to a helium-3 nucleus, whereby T incorporated in OBT leaves behind a 'gap' (destruction of hydrogen bridges in DNA; (LW 79); decay of T incorporated in the 5 position of certain DNA precursors produces mutations during DNA replication at

a rate approaching 100% (Kr 76), b) the recoil momentum of the nucleus in beta dcay is sufficient to break other C-H bonds and allows substitution of T in any position occupied by a hydrogen (NC$_{79}$); and (!) ionization of cellular water, with the formation of hydrogen peroxide, a cell toxin (Re 85).

8) As is the case with most environmental contaminants, virtually all the discussion of tritium focusses on human health, plants and animals being included in so far as they serve food for man. Many of the above mechanisms play an equally important role in the rest of the biosphere, however, with biological damage being recorded following surprisingly low concentrations of tritium contamination (Ab 79).

9) A problem deserving special attention is that of the passible connection between discharges of tritium on the vitality of forests. Reichelt has found a correlation between forest die-back and plumes from nuclear facility stacks (Re 85) Mist droplets containing hydrogen peroxide arc considered by some investigators to constitute a major cause of forest die-back,, possibly even more significant than SO$_2$ and NOx (S1 86).

10) A recent detailed epidemiological study (Be 85), has revealed a clear link between prolonged exposure to low levels of tritium and the occurence of the cancer of the prostrate. The study analysed the records of more than 39,000 people of both sexes who had been employed since 1946 at British atomic energy facilities. Some 3400 of these had died, of whom 38 of prostatic cancer while between the ages of 15 and 74. In those men who had been exposed to tritium, mortality from this form of cancer was 8.89 times the national average.

Within a 65 Km radius of the U. S. Savannah River Plant, where massive amounts of tritium arc released to the environment, doctors identified in 1983 at least 25 cases of the incurable and extremely rare blood disease polycythemia vera, a number significantly higher than the U.S. average. The disease involves an abnormal growth of all types of blood cells, and Can lead to leukemia, cardiac diseases and brain haemorrhage.

In summary, tritium contamination of the biosphere as a whole constitutes a far greater problem than is commonly supposed. From a wide variety of sources, tritium is released to the environment in extremely large quantities, on a routine basis. It gets incorporated in all biochemic molecules and has been shown to have deletrious biological effect at low levels of exposure. We must address the problem of radioactive contamination seriously, on a worldwide basis. Clearly, the ICRP recommendations are very unrealistic, even given only the specific research concerning tritium.

It should be added the same basic biological hazards arc associated with carbon-14, another radionuclide routinely discharged by the nuclear fuel cycle. Although the quantities released are far smiller - though still considerable - the long half-life of C-14 (5730 years) means that the consequences of the lack of management today will be felt for many milennia to come.

Unless serious measures are taken to phase out nuclear power and weapons, the whole biosphere will become seriously tritiated besides getting contaminated with numerous other persistent radionuclides. The problem is not being taken seriously anywhere in the world. One of the solutions considered by Canada is to extract tritium by cryogenic techniques from the tritiated heavy water moderator in CANDU reactors. This solution (which would appeal greatly to Indian nucleocrats - Ed.) is worse than the original problem since the major use of large amounts of tritium is in thermonuclear weapons.

Thus, the military-industrial complex continues to poison the earth and to threaten us with ever more weapons of mass destruction. It is time for a change, while there is yet time.

Nigel Hark

Nigel Harle is a Dutch antinuclear activist. An autodidact,' who follows his common sense, reads the literature and unencumbered by considerations of career, speaks out where others remain silent. He has compiled 'Tritium fact sheet' from which this article has been extracted

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Victory at Shoreham

New York State and Long Island Lighting Company (Lilco) have reached agreement that is likely to result in the abandonment of the Shorcham nuclear power plant in Long Island near New York City. It would be the first time in the United States that a fully completed nuclear plant was shut down before it began operating. With this the U.S. has joined Austria and the Phillipincs - nations which have drawn back from the brink by abandoning completed nuclear plants before they became critical .

Expenditure on the Shorcham plant now exceeds $5.3 billion and the interest and other financial charges are accumulating at the rate of $35 million per month. In dollars pec kilowatt, no U.S. power plant has cost as much as Shorcham, and no generating capacity of any kind has taken as much time to complete.

Moreover, the Shorcham plant is at the centre of a controversy that has ramifications- for all the 103 nuclear power plants operating in the United States as well as the 21 under construction. For example, the $4.5 billion Scabrook nuclear plant, on the New Hampshire coast near Massachusetts, is in much the same situation as Shoreham; it too has been completed but has yet to obtain an operating license.

It was in 1968 that Lilco formally applied to the U.S. Atomic Energy Commission for a construction permit to build a nuclear power station on Long Island. The plant was expected to cost between $65 to $75 million and to be on line by 1973.

Enormous opposition to the plant developed because of the concern that Long bland could not be safely evacuated in case of 2 nuclear emergency. Fears of an accident have been dominant in the minds of the residents of Long bland ever since the Three Mile bland accident in 1979. It was only after that accident that the Nuclear Regulatory Commission (NRC) formally incorporated emergency planning into the process for granting operating license. Suffolk County (*in* which Shorcham is located) and' New York State have both maintained that evacuating the area around Shorcham is impossible for geographic reasons. Thus, inspite of the fact that Shoreham was the most inspected plant in the United States and had many additional safety devices over and above those required by the NRC, it was unable to obtain a license. To the opponents, the real issue was one of local control Over local affairs - whether local communities have the right to decide to have an enormously hazardous plant in their midst. As Wayne Prospect, chaiman of the energy committee of the Suffolk County legislature, said, "How we will turn our lights on - that's a question we will solve".

Editors Note : The Shorcham saga is an inspiring tale for the antinuclear activists everywhere. It demonstrates the power of an awakened public opinion. The issue, which began as a purely local issue escalated first into a statewide and then into a national issue. Its denouement has long term implications for the future of nuclear industry everywhere. A lot of litrature is available on the full story of Shorcham including a book, *Power Crazy* : *Is Lilco Turning Shoreham into America's Clicmobyl* by **Karl Grossman.** Another, and probably easier to obtain referrence for Indian readers is a scries of 3 articles in IEEE Spectrum (See Sources Below).

Sources : *The Shoreham Saga, IEEE Spectrum November* 1987.
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Heavy loss instead of heavy water

A welcome feature of the present government is that unlike it's predecessors it has allowed the office of the Comptroller and Auditor General of India (CAG) to audit atomic energy programmes and to publish findings. Here is what the ***CAG*** *has to say about the Tuticorin Heavy Water Plant.*

- The Tuticorin Heavy Water Plant (THWP) of the Department of Atomic Energy worked only at one-fifth (20.6 per cent) of the installed capacity during eight years after it was commissioned in 1978 resulting in a production loss of Rs. 123.97 crore.

At- the time of setting up of the plant, the cost of indigenous production of heavy water was estimated to be Rs. 500 per kg which compared favourably with the then landed cost of Rs. 670 per kg. It was now expected to go up to Rs. 13800 per kg 'on the basis of actual average annual production." The plant has operated only for 1284 days as against 2550 available days.

These startling revelations have been made in the latest report of the Comptroller and Auditor General of India on Scientific Departments presented in Parliament. The Tuticorin Heavy Water Plane was set up as part of the Indian Nuclear Power Programme aiming at an installed capacity of 10,000 Megawatt by 2000 A.D. through the establishment of a chain of natural uranium fuelled thermal reactors with pressurised heavy water used as moderator and coolant.

The report has observed that "scries of repairs, replacement and modifications at additional cost" coupled with "low production" has changed the "economic profile" of the plant. It says 'due note" has been taken of the view point that conventional methods of financial propriety and procedure should not be the yardstick in the case of scientific departments striving for self-reliance in hi-tech processes 'as a certain amount of hit and miss could happen in attempting to catch up with fast changing technology" and has left it for 'Parliament to judge how much of the scarce resources could be diverted to such ventures,"

Ironically, the plant is considered to be the "most successful" of operational heavy water plants in the country, having produced about 60 per cent of the indigenous heavy water the total requirement of which is estimated at 13,000 tonnes.

The plant was originally scheduled to be commusioned by January, 1975, after a technical collaboration agreement was entered into with a French consortium in April 1971. The plant, instead was commissined in July 1978, marking a delay of 42 months. However, the foreign collaborator—M/s Gelpra—was 'absolved of all their contractual obligations, guarantees, warranties etc., because "the. plant could not be run and tested on sustained basis due to power shut-down etc."

"In sum', the report remarks, "the imported technology had not. been successful but **the** foreign collaborator had been absolved of **all** contractual obligations." The technology transfer was incomplete at the time of **the** termination of the contract, the report says.

Citing technical reasons for the shortfall in production, the report notes that several modifications were carried out to overcome the identified problems. "This resulted in additional financial burden. The report observes: "In the light of the actual average annual production, the technology absorption and stabilisation of operational procedures seem doubtful."

The cost of production was first revised in 1979. It worked out to be Rs. 1145 per kg 'but many instalments of additional investment and shortfall in production have considerably escalated the cost of production. "The Department of Atomic Energy stated in September, 1987 that the cost of production at the achievable capacity worked out to be Rs. 4120 per kg but, according to the report, "this is only notional because the actual average production is much less than the achievable (derated) capacity taken tor the purposes of calculation by the department."

The report estimated the cost of production to be Rs. 13800 per kg. The factors which had contributed to high cost were, apart from low production levels, "increased capital deployment and increased consumption of utilities and spares". The maintenance cost was Rs. 1301 per kg, the consumption of power "was more than twice the limits indicated in the project report", the cost of utilities was Rs. 4000 per kg and the number of persons employed rose to 457 against only 35 persons who were to be given employment in accordance with the original agreement with the French consortium.

Courtsey : *Pushp Saraf Express News Service*
Indian Express : 29.4/88.

Ideological plurality is good for the movement

The recently concluded 'Save the Western Ghats' march has been a major milestone in the growth of the Indian environmental movement. For the first time, as many as 160 groups participated in the six-month long march.

More significantly, the march was not built around a single leader—indeed, the organisers worked hard to hold to the original idea of a movement composed of a decentralised and informal network of organisations.

This lack of ideological unity and charismatic leadership, deplored by some participants, can actually be viewed as a sign of the movement's muturity. The debates at the concluding session of the march were reported to be fierce: two of the more contentious issues being the utilisation of a religious idiom in spreading the message of environmentalism and the role of the government in ecological destruction and restoration.

The Western Ghats march provides an appropriate point of departure for an interim assessment of the problems and possibilities of the Indian environmental movement. We have corns a long way since the 1972 Stockholm conference, when the Third World dismissed - environmental protection at a Western fad. This growing consciouness is reflected at the popular level by the mushrooming of voluntary groups working in the field of environmental action and ecorestoration; and at an official level by the formal enactment of comprehensive legislation for controlling air and water pollution and protecting biological diversity.

During the last 15 years—that is, since the inception of the Chipko movement in 1073—the environmental movement in India has grown to such an extent that it may justifiably be viewed as perhaps the most effective in the Third world. While this spurt in environmental consciousness has been widely commented upon, what is less visible is the emergence of three distinct ideological perspectives within the movement.

The first strand, which we may call symbolic Gandhian, relies heavily on a religious idiom in its rejection of the modern way of life. It upholds the precolonial and pre-capitalist village community as the exemplar of ecological and social harmony. 'The methods of action favoured by this group are squarely in the Gandhian tradition—or at least of one tendency within it—fasts, *padayatras,* and *poojas* in which a traditional cultural idiom is invoked to further the strictly modern cause of environmentalism. The second, and perhaps most vigorous strand, can be termed a*ppropriate technology.*

Less strident in its opposition to industrial society, it strives for a working synthesis of agriculture and industry, big and small units, and Western and Eastern technological traditions. Both in its ambivalence about religion and in its unequivocal criticisms of hierarchy in modern and traditional society, it is markedly influenced by Western socialism. In its emphasis on constructive work, it also taps a somewhat different vein in the Gandhian tradition. This strand has done pioneering work in the creation and diffusion of appropriate technologies which use natural resources.

The third and most eclectic strand embraces a variety of groups who have arrived at environmentalism only after a protracted engagement with conventional political philosophies, notably Marxism. These include the so-called Peoples Science Movements—for example, the Kerala Sastra Sahitya Parishad—whose initial interest in "taking science to the masses" has widened to include environmental protection. The People Science Movements can be distinguished from the Gandhian elements in two major ways : in their unremitting hostility to tradition, and in the relatively greater emphasis on confrontational movements.

Interestingly, these disparate trends are reflected in the trajectory of India's most famous environmental initiative, Chipko. Whereas the group working with Sunderlal Bahuguna opposes industrial civilisation in its entirety, the group associated with Chandi Prasad Bhatt is closer to the appropriate technology strand. Finally, the wing of Chipko active in Kumaon is composed largely of Marxists who favour militant struggle.

Not withstanding these differences, one way in which all these strands within Indian environmentalism differ from the dominant thrust of the Western environmental movement is in their focus on equity and sustainability. Taking the industrial economy and consumer society for granted, Western environmentalists are far more concerned with "quality of life" issues such as the retention of biological diversity as a temporary haven from the workaday world, By contrast, environmental degradation in India is undermining the process of economic development itself-as the mismanagement of natural resources is both the cause and consequence of poverty and an inequitous social structure. The environmental movement has no choice but to emphasise the importance of nature as a resource for survival and subsistence as well as the imperatives of economic redistribution.

While symbolic Gandhians, appropriate technologists and ecological Marxists represent the three most forceful strands in the environment-development debate in the country, two additional points of view should be considered. One looks to protect the environment while excluding development from its horizons—this is the wildlife protection movement, votaries of which have tended to value certain animal species (for example, the tiger) higher than the less privileged members of their own species. Then we have the incurable optimists who view development in isolation from the environment, in the naive belief that there arc no physical limits to economic growth and that rapid industrialisation on the Western model can be brought about in a matter of decades.

The environment debate in India is as yet in its very early stages. The emergence of three clearly defined groups augurs well for the future development of the movement. While the moral critique of the symbolic Gandhians is combelling, their total rejection of modernity is problematic. As for the Marxists, while they arc especially strong in mobilising action, they are some what confused and disoriented in the long periods of social quiescence. Perhaps the most promising group at present are the appropriate technologists. Their perspective is most consistent with reality, whereas their political orientation is a balanced mix of activism and reconstruction.

However, both symbolic Gandhians and ecological Marxists play a critical role in widening the horizons of the movement. Too easily dismissed as ideological and political "extremists" respectively, they have helped greatly in sharpening the terms of the debate and in creating a public space for the activities of the appropriate technology strand.

In the interests of a continuing play of democratic forces-both within the movement and in society—this ideological plurality is to be welcomed.

Ramachandra Guha

Courtsey : Times pf Mia : 31.5.1988.
RamachadraGuha, Centre for Ecological Sciences Indian Institute of Science, Bangalore 560012,

THE MALADY AND THE CURE

Today there is pervasive discontent all over the country. It results in inactivity and frustration and breeds irresponsibility all around. How do we channelise this discontent to create something positive is the prime question of today.

To expect the powers that be to redress people's grievances and bring about a fundamental transformation is to expect the impossible because today's office-bearers have a vested interest in this system. These problems have been created by the self-seeking politicians, plutocrats and beaurocrats.

This state of affairs is giving rise to different people's movements. There is the kisan movement, the antinuclear movement, the ecological movement like chipko and appiko, the womens movement for liberation, the anti-cow slaughter movement, the prohibition movement, movement for the decentralisation of power, the Jharkhand movement so on and so forth. All these movements have arisen and gained momentum outside the fold of political parties in these two decades thereby making parties irrelevant.

Even though some of these movements may appear to achieve their limited objective, as days pass by their very objective will be found to have receded further. It will be discerned that the state or the juggernaut of industrialization has created many more problems than the movement has solved.

Therefore unless all these unite on one platform and create a broad front for changing the whole anti-people system, not much headway seems to be possible for any one cause. The sooner this grim realization dawns on all concerned the better. This does not mean giving up movements for particular causes. Instead it means to pursue these more vigorously with a view to bring about a holistic conscientisation of the people, as well as to unite on the programme *to* change the politico-economic social system.

To attain this objective, we shall have to examine the methodologies of these movements affresh. Cessation of work, blockade of roads, bandhs, rallies, gheraos, jail bharo etc. are all right to generate confidence and boost the morale of participants by a massive show of strength. But these programmes have ceased to be novel anymore and have reached their saturation point,. Though these have not become counter productive. The establishment allows these to take place knowing full well that bandhs or rallies cannot last long. Persons participating in these militant actions will get exhausted. This will end in the status quo remaining unchanged. If any specific law is broken as part of jail bharo, government does not arrest satyagrahis or arrests them for a couple of hours and lets them off. This has become a routine affair, both with the satyagrahis and the authorities. How can millions of people march from their homes to the capital or district headquarters for rallies etc. every now and then, leaving their homes and workplaces

So a realisation is dawning as to why should we fight our battles on the field of the adversary Why not fight it out on our own field i.e. in villages and towns where we stay? Why not change methods and tactics? Why not opt out of the system as far as possible by boycotting it, by ignoring it and carrying on our work by creating a new system instead ?
For instance, if supplies of raw materials are stopped to towns and factories or if courts and police stations are not resorted to for the settlement of disputes and these arc settled by the old Panchayati system, can the present inequitous system be carried one Additionally, if goods manufactured in the centralised system like mill-cloth, soap or footwear are boycotted and instead village made cloth, soap and footwear are used, what will happen If ministers who represent this system are not invited for inauguration or for presiding over social functions and if their public meetings are boycotted how long can they hold out against this political, economic

and social non-cooperation movement? Along with this negative aspect, in the very course of fighting out this system, we are creating a new system based on self-reliance, mutual sharing, decentralisation etc. If voters, instead of lying scattered, come together to constitute voter's councils and set up peoples' candidates based on certain criteria at election-times are we not utilising the ballot box-fruitfully to create a political apparatus responsive to people's aspirations, thereby making democracy participatory and meaningful?

All these ideas need widespread experimentation. More and more innovations on these lines is the need of the day. All these must become an integral part of the new life movements. This and such other kindred matters need serious consideration and community action so as to bring about a fundamental systemic transformation that is total revolution.

Thakurdas Bang
Gopuri, Wardha

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Editor Anumukti,
Sampoorna Kranti Vidyalaya,
Vedchhi, Via Valod.
District: Surat 394 641.
Editor: Surendra Gadekar
Printed at:
Bhargava Bhushan Press, Varanasi.-5/7. 88

We regret the late publication of this Issue.

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

More than a mere Journal, it is an idea whose time has come

(at least to renew subscriptions)

With this issue, Anumukti completes one year of publication. Today Anumukti has 410 regular subscribers of whom 27 are abroad. It is the generous and steadfast support extended by you that has allowed Anumukti to survive. But is survival everything? Anumukti is a movement and it needs to grow. Please renew your subscriptions and persuade friends to subscribe.

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Some Back Issues are Available

The next issue (vol.2 No 1— August '88) of Anumukti will focus on Nuclear Power and Nuclear weapons. Future issues will focus on Alternatives, Decommissioning, Fast Breeder Reactors etc. Do send in your articles.

PRINTED MATTER BOOK POST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol 2 No. 1 **August 1988**

> *"Through the release of atomic energy, our generation has brought into the world the most revolutionary force since the prehistoric discovery of fire. This basic power of the universe cannot befitted into the outmoded concept of narrow nationalisms. For there is no secret and there is no defence; there is no possibility of control except through the aroused understanding and insistence of the peoples of the world.*
>
> *We scientists recognize our inescapable responsibility to carry to our fellow citizens an understanding of the simple facts of atomic energy and its implications for society. In this lies our only security and our only hope. We believe that an informed citizenry will act for life and not death."*
>
> *Albert Einstein*

"You ought to focus your journal on the nuclear arms issue. That way, you will get more support. Nuclear energy is still a debatable issue," so said a friend last year during a discussion on the contents and emphasis of *Anumukti*

I disagreed. Precisely because nuclear energy was 'still' a debatable question, it required a journal to air views contrary to the dominant paradigm. Does anybody need an argument to be convinced of the sinful horror, the utter futility and the terrible wastefulness of nuclear weapons, I wondered ?

A year wiser, I find myself devoting at least this number to the weapons issue. With my background in physics, I find the clamour for the Bomb among influential sections, extremely strange. Search the physics departments of any of our prestigious centres of learning with a fine comb and it would be difficult to find a genuine 'damn the consequences' probomber. But a casual glance at the 'humanities' departments or at that esoteric breed, the think tankers, reveals an embarassing profusion of such mis-(sile)guided enthusiasts. A few honourable exceptions apart, politicians, (as usual), take the cake. Ruling party rubber-stampers to oppose everything opposition disunionists, lily-white secularists to dyed in the wool communalists, Akhand Bharat centrallists to 'Sons of the Soil state rightists, the 'Aya Rams' as well as the 'Gaya Rams', horror of horrors even some 'Gandhians', all proclaim their love for the Bomb. Mixed with their righteous horror at nuclear devastation, is the perpetual refrain, "But what are we to do if Pakistan builds the Bomb ?" The best they suggest is continuation of the present sterile and dangerous policies of nuclear ambiguity. One begins to wonder if all the contestents for the pilot's seat are Dr. Strangelove's clones

Tough-talking realists who occupy the corridors of power, have put us on a treadmill; making us run for all we are worth in an unending quest for arms (commisions). The weapons become obsolete with increasing rapidity and need to be replaced by ever more deadlier weapons. Instead of options remaining open, they arc foreclosed. The Bomb is the only option-our ticket to the 'Big' league.

Peace is a positive value. It is more than the mere absence of strife. Only in genuine peace can we work out the real problems : of hunger and poverty and disease and ignorance; of sustainable and equitable devolopment; of finding the root causes of violence within our society and without; of substituting cooperation instead of competition as the basis of existence. A world view which envisages no greater role for India than that of an emerging regional bully, just will not do.

Nuclear energy and nuclear weapons are a package deal. Have one and the arguments for having the other slowly become irresistable. After all making the bomb is just a small step when the long road of collecting material and know how has already been traversed. Inevitably it is also a step on the road marked not security but assured destruction. *Anumukti* as the name itself indicates stands for the unilateral rejection of both.

From being known as the land of the Budha to achieving notoriety as the land, on whose bomb Budha smiled is indeed a great fall. All the King's men and all the King's horsepower are not going to put us on that pedestial again. It will need all of us 'common' folk to accomplish this task.

Surendra Gadekar

LETTER BOX

I suggest that *Anumukti* may cover the whole Indian subcontinent and you may like to make such an announcement in your sub-title : A JOURNAL DEVOTED TO NON-NUCLEAR SOUTH ASIA, and perhaps ask for a few activists from neighbouring states to be associated with the publication.

A request : Please aviod fundamentalistic assertions e.g., in your editorial, p.2. "Hope lies in the vision of Gandhi,........and Emerson - a world in which all creation can live together in peace and respect." In principle I agree with you and I have empathy with these views. But the opposition to nuclear technology is based on scientific findings, reasons, and calculations, -not merely on the emotive appeals of moral and/or humanistic arguments. Our task is to provide technoscientific basis for the moral reasoning of Gandhi, Tolstoy, Thoreau and Emerson.

Dhirendra Sharma, Delhi

I have just received the latest (June'88) issue of Anumukti. I must say that I am not always able to read it carefully. But I do glance through. I feel it is a very good effort and the standard of the journal is always good. You must never give up. I am sure it will improve further. The notices of future issues that you have given are quite exciting.

What I mainly wanted to write through this letter is that I liked your editorial *'Fire and Ice'* immensely. It is brief, precise and conveys the important point of orienting the young.

Natwar Thakkar, Nagaland

Daughter of the A-Bomb

Yuriko Hatanaka, 42, is a daughter of the Hiroshima atomic bomb. She was in the womb when the bomb dropped.

Yuriko has the mental capacity of a child of two. She can neither dress nor go to the bathroom by herself.

Her vocabulary consists of a very few and simple words. She spends her day looking at the picture magazines in her father's barber shop. "She loves to look at the pictures, but she cannot understand that these magazines only come out once a week," said her father, Kunizo. "She throws a tantrum when she has been through them all. She thinks that I do not want to fetch her some more."

Yuriko was a three-month foetus when the atomic bomb "Little Boy" devastated Hiroshima on August 6, 1945.

"My wife was pregnant, she was on her way to work when the bomb exploded," Kunizo Hatanaka said in an interview. She carried our little boy on her back. They were nearly three miles (4 km) from the hypocenter, and they only suffered superficial cuts from flying pieces of glass. Within two weeks both of them became ill from radiation, and my son was dead by the time 1 got back from army duty in early September.'

'My wife was an appalling sight. She bad lost all her beautiful long hair, and her gums would not stop, bleeding. But she was a strong woman. She went through with her pregnancy, and on February 14, 1946, Yuriko was born," Hatanaka said.

"As Yuriko grew up, we become aware that something was wrong. At three she could neither walk nor speak, We went to the American experts of the Atomic Bomb Casualty Commission in Hiroshima. They told us that Yuriko was an ordinary case of malnutrition."

"We went to a Japanese professor at the medical faculty of Hiroshima University. He was very nervous because at the time Japanese scientists were not allowed to conduct independent research into the effects of the atomic bomb. But finally he agreed to check Yuriko's condition. His diagnosis was 'microcephali-born with an abnormally small brain. Then we knew she would never be able to take care of herself."

In 1965 Japanese journalist Ohmuta Minora, **now deputy editor of the Hiroshima newspaper Chugoku Shimbun,got hold of the classified reports from the Atomic Bomb Casualty Commission.**

He disclosed that the commission had found 44 other cases exactly like Yuriko's. The children were all born within a few months of the blast,

"We joined other parents and formed the Mushroom Club", Hatanaka said. "With the assistance of the journalist, we started campaigning for compensation."

In 1968, when she was 22, Yuriko and 23 other children were officially recognised as "Hibakusha"—atomic bomb victims. Yuriko now receives a monthly allowance of 104,000 Yen (about $400), less than half the average wage in Japan.

"Ten years later my wife started complaining about pains in her hipbones. Gradually the pain spread up her back and down her legs. A local doctor took some tests. A few weeks later we received the results: she was suffering from bone marrow cancer.

"I could not afford the expensive medicine and care, so I applied to have my wife registered as an atomic bomb victim in order to get free medical treatment."

"But my application was returned. The authorities needed more information. On December 23, 1978, my wife was finally recognised as a victim. She died the next morning, at the age of 57."

With tears in his eyes. Kunizo Hatanaka shows visitors a video recording of his wife's funeral.

"Every Sunday we visit the cemetery. Yuriko puts her head at the tombstone and says, Ear, ear. It means: I can hear my mother,

Thomas Bo Petersen is a Danish freelance journalist who specialises in Asian affairs.

Courtsey : Asia-Pacific Environment Volsno 2

Notice

We have received complaints from some readers that they did not receive issue no 5 (April '88). This is the result of some postal foul up. Any subscriber who has not received this issue should write to the Varanasi addres of the Editor and we will send

a copy immediately. We regret the inconvenience caused.

A Call For Sanity

Adequate words are lacking to express the full seriousness of our present situation. For over 30 years wise and far-seeing people have been warning us about the futility of any war fought with nuclear weapons and about the dangers involved in their cultivation. Some of the first of these voices to be raised were those of great scientists. They have tried to remind us that there Could be no such thing as victory in a war fought with such weapons. So have a great many other eminent persons.

When one looks back today over the history of these warnings, one has the impression that something has now been lost of the sense of urgency, the hopes, and the excitement that initially inspired them, so many years ago. One senses, even on the part of those who today most acutely perceive the problem and are inwardly most exercised about it, a certain discouragement, resignation, perhaps even despair, when it comes to the question of raising the subject again. The danger is so obvious. So much has already been said..What is to be gained by reiteration »What good would it do now

Look at the record. Over all these years the competition in the development of nuclear weaponry has proceeded steadily, relentlessly, without the faintest regard for all these warning voices. We have gone on piling weapon upon weapon, missile upon missile, new levels of destructiveness upon old ones. We have done this helplessly, almost involuntarily: like the victims of some sort of hypnotism, like men in a dream, like lemmings heading for the sea, like the children of Hamlin marching blindly along behind their Pied Piper. And the result is that today we have achieved, in the creation of these devices and their means of delivery, levels of redundancy of such grotesque dimensions as to defy rational understanding.

I say redundancy. I know of no better way to describe it. But actually, the word is too mild. It implies that there could be levels of these weapons that would not be redundant. Personally, I doubt that there could. I question whether these devices are really weapons at all. A true weapon is at best something with which you endeavor to affect the behavior of another society by influencing the minds, the calculations, the intentions, of the men that control it; it is not something with which you destroy indiscriminately the lives, the substance, the hopes, the culture, the civilization, of another people.

What a confession of intellectual poverty it would be—what a bankruptcy of intelligent statesmanship—if we had to admit that such blind, senseless acts of destruction were the best use we could make of what we have come to view as the leading elements of our military strength !

To my mind, the nuclear bomb is the most useless weapon ever invented. It can be employed to no rational purpose. It is not even an effective defense against itself. It is only something with which, in a moment of petulance or panic, you commit such fearful acts of destruction as no sane person would ever wish to have upon his conscience.

There are those who will agree, with a sigh, to much of what I have just said, but will point to the need for something called deterrence. This is, of course, a concept which attributes to others—to others who, like ourselves, were born of women, walk on two legs, and love their children, to human beings, in short—the most fiendish and inhuman of tendencies.

But all right : accepting for the sake of argument the profound iniquity of these adversaries, no one could deny, I think, that the present Soviet and American arsenals, presenting over a million times the destructive power of the Hiroshima bomb, are simply fantastically redundant to the purpose in question. If the same relative proportions were to be preserved, something well less than 20 per cent of those stocks **would** surely suffice for the most sanguine concepts of. deterrence, whether as between the two nuclear superpowers or with relation to any of those other governments that have been so ill-advised as to enter upon the nuclear path. Whatever their suspicions of each other, there can be no excuse on the part of these two governments for holding, poised against each other and poised in a sense against the whole northern hemisphere, quantities of these weapons so vastly in excess of any rational and demonstrable requirements.

How have we got ourselves into this dangerous mess

Let us not confuse the question by blaming it all on our Soviet adversaries. They have, of course, their share of the blame, and not least in their cavalier dismissal of the Baruch Plan so many years ago. They too have made their mistakes; and I should be the last to deny it.

But we must remember that it has been we Americans who, at almost every step of the road, have taken the lead in the development of this sort of weaponry. It was we who first produced and tested such a device; we who were the first to raise its destructiveness to a new level with the hydrogen bomb; we who introduced the multiple warhead; we who have declined every proposal for the renunciation of the principle of "first use"; and we alone, so help us God, who have used the weapon in anger against others, and against tens of thousands of helpless non-combatants at that.

I know that reasons were offered for some of these things. I know that others might have taken this sort of a lead, had we not done so. But let us not, in the face of this record, so lose ourselves in self-righteousness and hypocrisy as to forget our own measure of complicity in creating the situation we face today.

What is it then, if not our own will, and if not the supposed wickedness of our opponents, that has brought us to this pass

The answer, *I* think, is clear. It is primarily the inner momentum, the independent momentum, of the weapons race itself—the compulsions that arise and take charge of great powers when they enter upon a competition with each other in the building up of major armaments of any sort.

This is nothing new. I am a diplomatic historian. I see this same phenomenon playing its fateful part in the relations among the great European powers as much as a century ago. I see this competitive buildup of armaments conceived initially as a means to an end but soon becoming the end itself. I see it taking Possession of men's imagination and behavior, becoming a force in its own right, detaching itself from the political differences that initially inspired it, and then leading both parties, invariably and inexorably, to the war they no longer know how to avoid.

This is a species of fixation, brewed out of many components. There are fears, resentments, national pride, personal pride. There are misreadings of the adversary's intentions—sometimes even the refusal to consider them at all. There is the tendency of national communities to idealize themselves and to dehumanize the opponent. There is the blinkered, narrow vision of the professional military planner, and his tendency to make war inevitable by assuming its inevitablity.

Tossed together, these components form a powerful brew. They guide the fears and the ambitions of men. They seize the policies of governments and whip them around like trees before the tempest.

Is it possible to break out of this charmed and vicious circle? It is sobering to recognize that no one, at least to my knowledge, has yet done so. But no one, for that matter, has ever been faced with such great catastrophe, such inalterable catastrophe, at the end of the line. Others, in earlier decades, could befuddle themselves with dreams of something called "victory."We,' perhaps fortu-

nately, are denied this seductive prospect. We have to break out of the circle. We have no other choice.

How are we to do it *

I have, no illusion that negotiations on the SALT pattern—-negotiations, that is, in which each side is obsessed with the chimera of relative advantage and strives only to retain a maximum of the weaponry for itself while putting its opponent to the maximum disadvantage— I have no illusion that such negotiations could ever be adequate to get us out of this hole. They are not a way of escape from the weapons race; they are an integral part of it.

Whoever does not understand that when it comes to nuclear weapons the whole concept of relative advantage is illusory—whoever does not understand that when you are talking about absurd and preposterous quantities of overkill the relative sizes of arsenals have no serious meaning—whoever does not understand that the danger lies not in the possibility that someone else might have more missiles and warheads than we do but in the very existence of these unconscionable quantities of highly poisonous explosives, and their existence, above all, in hands as weak and shaky and undependable as those of ourselves or our adversaries or any other mere human beings: whoever docs not understand these things is never going to guide us out of this increasingly dark and menacing forest of bewilderments into which we have all wandered.

I can see no way out of this dilemma other than by a bold and sweeping departure—a departure that would cut surgically through the exaggerated anxieties, the self-engendered nightmares, and the sophisticated mathematics of destruction, in which we have all been entangled over these recent years, and would permit us to move, with courage and decision, to the heart of the problem.

Any path to peace, it will be argued would have risks involved. Possibly so. I **do not see them. I do not deny the possibility. But if there are, so what Is it possible to conceive of any dangers greater than those that lie at the end of the collision course on which we are now embarked And if not, why choose the greater—why choose, in fact, the greatest—of all risks, in the hopes.of avoiding the lesser ones**

We are confronted here, my friends, with two courses. At the end of the one lies hope—faint hope, if you will—uncertain hope, hope surrounded with dangers, if you insist. At the end of the other lies, so far as I am able to see, no hope at all.

Can there be—in the light of our duty not just to ourselves (for we are all going to die sooner or later) but of our duty to our own kind, our duty to the continuity of the generations, our duty to the great experiment of civilized life on this rare and rich and marvelous planet—can there be, in the light of these claims on our loyalty, any question as to which- course we should adopt

In the final week of his life, Albert Einstein signed the last of the collective appeals against the development of nuclear weapons that he was ever to sign. He was dead before it appeared. It was an appeal drafted. I gather, by Bertrand Russell. I would like to quote one sentence from the final paragraph of that statement, not only because it was the last one Einstein ever signed, but because it sums up, I think, all that I have to say on the subject. It reads as follows:

We appeal, as human beings to human beings: Remember your humanity, and forget the rest.

George. F. Kennan

George. F. Kennan was for a long time the U.S. ambassador to Moscow. He made this Speech on May 19, 1981 *while accepting the Albert Einstein Peace Prize. Portions of the speech have* ***been*** *edited for space considerations. The original is available from THE INSTITUTE FOR WORD ORDER* 777 *United Nations Plaza New* ***York, NY*** **10017.*U.S,A.***

Safeguards or Safethefts ?

It doesn t take much to make an atomic bomb. A few kilogrammes of Plutonium or enriched uranium and a little knowhow are the only requirements. With even graduate students making plausible bomb designs with publically available information, knowhow is no longer a problem. As the following two articles illustrate, plutonium too is no longer a problem. Today, nations have been clandestinely making the bomb. How long do we wait before terrorist organizations jump into the 'game.*

Recently, the Vienna-based International Atomic Energy Agency (IAEA) announced that during 1987 it "did not detect any anomaly" which would indicate the diversion of a significant amount of safeguarded nuclear material anywhere for military purposes. The statement is part of an annual ritual that the IAEA performs, in order to assure the world that there is no "misuse of facilities, equipment or non-nuclear material..."; in other words, that the non-proliferation regime it presides over is working smoothly ana no civilian nuclear material under safeguards is being clandestinely diverted to weapons programmes.

The agency puts out such a public statement as the conclusion of its annual safeguards implementation report (SIR), itself a classified document. However, it now emerges that such statements are a misrepresentation of the SIRs. The Green Alternative European Link in the European Parliament has for the first time made public the SIR for 1986 and a Dutch ecology group has quoted extensively from the SIR for 1976.

Summarised by the World Infor- . mation Service on Energy (WISE) in its news communique of June 10, the SIRs show that large quantities of nuclear material under the IAEA safeguards could in fact have been diverted for military purposes in a number of countries, that the IAEA has no reliable way of determining tht they were not so diverted and that the problems of policing nuclear **installations are so complex as to be virtually insurmountable within the present framework of surveillance**

Thus we cannot be reasonably certain that the existing system of safeguards is worthy of our confidence. Nation-states bent upon diverting and using "civilian" nuclear material to build nuclear weapons or "peaceful nuclear explosive devices" cannot be effectively prevented from doing so under the existing safeguard regime.

A Question Mark

This puts a big question mark over the nuclear Non-Proliferation Treaty of 1970. The NPT has been criticised as an unequal and discriminatory treaty. It is undoubtedly that. Equally significantly, however, the NPT must be seen as a treaty that could not have prevented vertical or horizontal proliferation.

Indeed, the very premises on which the NPT was based are questionable. Of the three premises, the first held that it would be possible to achieve a "cessation of the nuclear arms race at an e?rly date only if the nuclear powers "pursue negotiations in good faith". As should be clear from experience at least until the INF treaty, the nuclear arms race has only intensified over the past 18 years; even the INF treaty has been signed outside the NPT framework.

The second premise maintained that there is a clear technical divide between the peaceful and military uses of atomic energy, which can be defended by a regime of safeguards. In reality such a divide was the invention of the nuclear industry which has been involved in both nuclear power generation and weapons production. It is therefore more appropriate to see the peaceful and military atoms as Siamese twins. A separation between the two is a function not of technology, but of political intentions.

The final premise was that the non-nuclear weapons states could be prevented from going nuclear only if the nuclear weapons states agreed to make civilian

nucleic technology available to them under IAEA safeguards. The last 18 years should shatter that illusion: more than half, a dozen countries have become threshold or de facto nuclear-weapons states. The IAEA safeguards regime with all its inadequacies is part of this development. It is as inseperable from it as the clandestine transfer of nuclear-military technology and material by certain states to favoured clients.

Timely Detection

To return to the IAEA's SIRs, what emerges is the following. In 1986, the agency's objective of "timely detection of diversion of significant quantities of nuclear material" could not be achieved in as many as 37 per cent of all facilities under safeguards. The "timely detection" interval is estimated by the IAEA to vary between ten days and six months. A "significant quantity" (SQ) is enough to make-at least one bomb of the Hiroshima or Nagasaki type—estimated by the agency as 25 kg of highly (90 to 95 per cent) enriched uranium of eight kg of plutonium (with 95 per cent Pu-239 in it), but said by other experts to be as little as 10 to 15 kg of highly enriched uranium or 2 to 8 kg of plutonium.

The limitation of the detection process should be clear from the fact th?t IAEA bases itself on a 95 per cent confidence interval. This when it is dealing with facilities that may contain 1,000 SQs or even 10,000 SQs. A five per cent gap could represent up to 500 nuclear bombs—a veritable arsenal.

Year after year, the SIRs state that the inspection goal could not be attained. Thus, the 1976 SIR concluded that the safeguards objective could not be realised in 16 out of 34 light water reactors. In 1986, the numbers were 77 out of 134 LWRs. The report also admits that the procedure followed to measure "normal operating losses" in nuclear plants leads "to artificially low values for material unaccounted for (MUF) and makes it difficult to draw valid figures from the MUF figures **regarding the possibility that diversion has occurred. It is known that the MUF tends to run cumulatively into hundreds of SQs.**

The 1986 SIR is even more disturbing. It says that "of the 147 installations where surveillance equipment was used... surveillance failed to provide conclusive results... at 82". This is a high *($6* per cent) failure rate. The number included 15 installations out of the 18 where television cameras were used. In other words, the failure rate tends to be even higher (at 83 per cent) where the surveillance is particularly close. "The inadequacies... are particularly manifest in those situations where shipments or receipts take place, or where spent fuel is handled" (e.g. in reprocessing plants which can generate weapons-grade plutonium) in certain forms.

These are technical problems of surveillance. But there are plenty of "man-made" or "political" problems too, related to the unwillingness of governments or private companies to provide information or access in time. Yet others derive from a shortage of skilled manpower. Thus, "in seven states, the safeguarded national inventory was between 1,000 SQ and 10,000 SQ..."(i.c. very large)..." The inspection goal for agency safeguards is evaluated as attained in four of these states" (i.e. not in the other three)... The main reasons for the failure are: "incomplete verification... and the fact that the material reported as shipped but not confirmed by the receiving state as received excee-ded one SQ."

A SIPRI study speaks of the "customary practice of refusing IAEA inspection access to the cascade area of the ultracentrifuge enrichment facility, a restriction rationalised by the desire to protect industrial secrets and recognised as legitimate in IAEA statutes." There have been instances of operators refusing to remove seals on nuclear containers for warranty reasons. Without removing the seals,

it Is not possible, to analyse the material.

The SIR also states: "The cooperation of states is needed in ensuring adequate and uninterrupted illumination in areas covered by agency surveillance devices." This resulted in "inconclusive surveillance results'.' in six installations in 1986. In other words, the operator can switch, off the power supply at a critical juncture and make sure that the IAEA cameras record nothing.

There are "problems in the deployment of manpower, largely due to insufficient flexibility of inspector designation restrictions." This made it 'necessary to concentrate efforts on the verification of quantities of nuclear material", giving the timeliness requirement the "secondary priority". This cannot possibly promote the inspection goal. Also ' there were seven states whose major problems arose mainly because they accepted fewer than the number of inspectors judged to be the minimum necessary".

Anomalies Explained

The report says that about 270 **'discrepancies or anomalies were found in 1986 *(160* in 1985) and most were "satisfactorily explained.." However, "in some of these cases, the inventory cannot be re-verified." Among the states that figures prominently in the IAEA report but is not named is West Germany where the inspection goal was not attained in 22 out of 38 facilities.- West Germany is incidentally the home of Nukem, which has recently figured in major scandals.**

Examples like these can be multiplied. What they show is that even an agency committed to the promotion of nuclear technology and closely allied with the nuclear industry has found it impossible to implement effective safeguards against proliferation. The divide between the peaceful and military uses of the technology is so fragile that a government bent upon diverting nuclear material cannot be physically stopped from doing so. The sooner the NPT and the IAEA regime are replaced by another arrangement the better it would be for the world.

Courtsey-Prafula Bidwai* : *Times of India.

"A Very Exciting Business"

'Eric' is a plump middle-aged man who at first glance appears quite unthreatening. But until three years ago, this man was a high tech arms dealer, illegally supplying both South Africa and Argentina with sophisticated military technology. He was also involved in an even deadlier trade, the sale of plutonium. He, and others like himself, are middlemen in the worldwide trade in plutonium, where the raw material for nuclear bombs is sold to anyone who wants, and can afford, to buy it. For Eric, it was a "very exciting business".

***The* story of Eric, a Belgian wanted by the police in three countries, is told in a remarkable documentary which was shown on BBC's Channel 4 television's "Dispatches" programme in late 1987 in the UK. It made public the first insider evidence of the existence of a nuclear blackmarket in weapons grade materials, a market whose existence has always been denied by the nuclear industry as well as the International Atomic Energy Agency.**

Eric, who asked the makers of the documentary not to use his last name, dealt regularly throughout the late. 1970's and early 1980's in smuggled nuclear technology, later entering the market for weapons grade material itself-both plutonium and enriched uranium. As a dealer, he supplied much of the hardware used in Argentina's nuclear programme. In late 1983 he was told proudly by a retired admiral responsible for one of Arg entina's high-tech research labs that Argentinahas it's first nuclear device. Since, then, lie's heard that they have had a second one since 1986. Argentina, needed

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to use black-market plutonium to develop its first device given the estimated output of its nuclear power programme at that time. Eric acknowledge! this, saying Argentina bought not only black market technology, but was buying mostly plutonium at the beginning of its involvement in the nuclear black market.

It was Israel, says Eric, which originally set up the black market. As long ago as 1965, 250 kilos of enriched uranium were diverted to Israel from an American plant. Israel has also long been suspected of several other diversions including, according to the documentary, the 1968 hi-jacking of a ship carrying uranium. In fact that case, known as the "Plumbat Affair", involves more than mere "suspicions". It is now generally acknowledged that the highjacking, in which zoo tonnes of concentrated uranium were stolen, was carried out by the Mossad, the Israeli Secret Service (see WISE NG 281.2833). By the time the Israelis had obtained enough material to carry out their own weapons programme, and their own technology was advanced enough not to need the black market anymore, there was a well developed network in place which was not going to just disappear because the Israelis no longer needed it. The people in the middle were not going to simply give up what Eric calls "such a nice operation.

The black market is based in Khartoum, the capital of Sudan, where a quantity of enriched uranium was seized by police last August. The documentary includes an interview Captain Assem Kabashi, a former officer of the Sudan State Security Organisation which provides details of how it operates. Indications are that in addition to Israel, Argentina and South Africa, countries involved in the black market include Libya, Brazil, Iraq, Iran, Syria, *Pakistan and India.* Following the August seizure by the police, Sudanese Prime Minister Saddiq al Mahdi admitted the existence of a nuclear black market and the involve**ment of prominent Sudanese busin esesmen - an admission which led to a growing political scandal implicating the Prime Minister's own family; Kabashi, who wrote a series of articles on the Khartoum connection which appeared in the Sudanese Press after the Prime Minister's admission, was arrested, but later secured release through former colleagues in State Security and went into hiding.**

Kabashi's articles revealed that the Sudanese dealers involved in these sales, some of whom were his former colleagues at State Security, had contacted a number of foreign countries, including Israel, through a syndicate in Italy. Eric, who says middle-men exist in France, England and Belgium, also confirms the existence of the Italian group. He says the Italians closed a deal for the sale of plutonium some 12 months before the documentary was made. The Italian group also had enriched uranium which they sold later on, as well as the batch of enriched uranium that was on sale in Khartoum in mid-August. In addition to Israel (which bought 2 kgs), buyers in the mid-August sale included, Ir?n (1 kg) and Iraq (2 kgs). With the Iraq/Iran war now in its eighth year, those countries are locked in a race for the bomb. The technology of weapons manufacture is well known and available to both countries. What they are now concerned with is the acquisition of weapons-grade material.

The documentary says that all together, at least six consignments of black market nuclear materials have passed through the Sudan since 1980. They include 12 kgs plutonium tested by South African experts and supplied to Iraq and a consignment of plutonium sent to an unknown destination in 1982.

According to former US .Central Intelligence Agency (CIA) Director, Admiral Stansfield Turner, who was interviewed in the course of the documentary, the source of the material for the black market is civilian nuclear plants. The documentary further pointed

out that, the most likely area where diversion- could occur is in the commercial reprocessing, and shipment of plutonium, (The danger posed by shipment has been substantially illustrated by the Transnukler scandal in Germany, see *WISENC* 286,2897. *Anumukti vol. 1 no* 4)

Most of the commercial sources for plutonium are now in Europe. Although there has been strong urging from the US for European plants to cut production of weapons grade material, the British, Germans and French have instead made plans for a huge expansion of production, resulting in large consignments of plutonium being transported around Europe, vulnerable to attack or theft. • (Despite its urgings, the US has potentially increased the problem with its pact with Japan which will allow reprocessing of US-controlled spent fuel in France, the UK or Japan, see WISE NC 278.2388 and 278.2387.)

Already, at the Dounreay Reprocessing Plant in Scotland, there has been an accumulated loss of more than six kilos of plutonium since 1980. During the same period there was an accumulated loss of over 20 kilograms of high enriched uranium. At the Sellafield reprocessing plant in Cumbria, UK, there have also been regular **shortfalls in plutonium stocks over the years. To compound the problem, the material accounting system- in these plants has a margin of error, which would allow a skilful diverter to remove material so that it would not even be missed. International safeguards to prevent civil plutonium from being diverted are, to say the least, flimsy. The IAEA, responsible for verification that countries have not acquired nuclear weapons, claim so far not to have found any case of diversion of fissionable material. Clearly, their 'safeguards' are incapable of handling the present situation. So how are they going to handle the new situation posed by the projected increase in plutonium production in Europe which will likely mean that there will soon be a surplus on the nuclear black market, increasing the risks even more. As if that wasn't problem enough, what is IAEA or anybody else going to- do about an even more frightening new development in the nuclear black market t According to Eric, the "supplying side", as he calls it, is trying to establish a new approach which would be to manufacture kits with everything you need to assemble your own bomb. You could buy it "lego", he says.**

Couttsev : WISE News Communique

Nuclear Policy Thy Name is Hypocracy

For about two decades after Hiroshima and Nagasaki, countries which wanted to become nuclear weapon powers were frank and honest about their intentions. The United States, the Soviet Union, Britain, France and China assertively developed their nuclear weapons programmes. Even Sweden declared its intention to become a nuclear weapons power but it gave up the programme under US pressure as well as because of the rising anti-nuclear popular sentiments in Sweden.

The US pressure oh Sweden to desist from making nuclear weapons illustrates the beginning of the non-proliferation regime and its exact opposite; namely clandestine nuclear weapon programmes by various countries. The cause of the horizontal non-proliferation was espoused by the super Powers and their allies because, by the late 1950's, they came to realize that nuclear deterrence was a "two person game"; the entry of a "third 'person" completely destabilized deterrence even for the two primary players. Britain and France could somehow be accommodated in the US "person" but China, having split from the Soviet Union, could not be. Hence strenuous attempts were made to prevent China from developing its nuclear weapons but they were not successful. Both the super powers reluctantly accepted China's entry into the "nuclear club" but they

redoubled their efforts to prevent any further' 'proliferation. That left clandestine development as the only way out for nuclear ambitious countries.

The ambitions of such countries are difficult to check despite the best efforts. The first attempt came in the form of the Nuclear Nonproliferation Treaty; non-nuclear countries were induced to join it through a mixture of inducements and threats. But several refused to sign the Treaty giving highminded reasons. This was followed by the imposition of International Atomic Energy Authority (IAEA) safeguards on countries which wanted to build nuclear power stations. This regime was further reinforced by a group of 12 .countries coming together (informally called the "Club of London'') which prevents the sale of nuclear materials outside the IAEA safeguards regime. All such efforts have registered only a limited success.

The most difficult problem about preventing proliferation is that the technologies for nuclear power generation and for producing weapon-grade fissile material are almost identical. While nuclear weapons have generally evoked feelings of horror, the generation of electric power based on the heat generated by a nuclear reactor has been largely accepted as benign and desirable. In countries such as ' India where the potential for developing coal or oil based thermal power or even hydroelectric power is limited, nuclear power generation .is considered by some as the only way out if the growing energy needs of the country are to be met.

In recent years, nuclear power generation has been subjected to a great deal of criticism. The per kilowatt hour capital costs of nuclear plants are escalating rapidly. Safety has always been a problem but since the Three Mile Island near-disaster and the Chernobyl actual disaster, public anxiety about nuclear power plants has grown tremendously. The storage and disposal of nuclear wastes from the plants is becoming a pressing problem as nuclear power stations grow in number and run for longer periods. Above all, some plants are now approaching the end of their useful life and the problem of decommissioning them have yet to be solved; even after entombment", they may have to be guarded for the next 2000-3000 years For all these reasons, ambitious plans for nuclear power (generation are being cut down drastically in the industrialised countries. In 1974, the plans envisaged the production of 4.45 million megawatts of nuclear power generation by the year 2000. But now the projection has been cut down to 0.4 million megawatts or less than 10 % of the original target. Some countries are cancelling all the new plants on order.

But the turning of the nuclear energy tide is taking place only in the highly industrialized countries. In the Third World, the expansion plans remain unaltered. In India, for example, the Atomic Energy Department is deter-, mined to go ahead with its plans despite horrendous cost-escalations, very serious time-lags, enhanced doubts about safety and the mounting problems of nuclear waste management.

If power generation were the sole objective, it can be achieved relatively quickly and efficiently by building the plants with foreign technology under IAEA safeguards* This the Government of India has ruled out for future plants. The high-minded principle behind this is self-reliance and rejection of discriminatory teatment. These are laudable principles but they are evidently not applied to other sensitive areas. For instance, the high technology weapon systems in the armed forces are almost wholly imported. High-speed computers are imported despite discriminatory conditions.

If power generation is the only aim, why the tremendous secrecy surrounding the operations of the nuclear plants In fact, except for the locations of the plants and their generating capacities, no other important detail is made known. The size of the uranium stockpile, the quantity of plutonium generated and of Pu-239 separated from the burnt fuel, even the total quantity of heavy water available and their sources are matters of speculation. The government- has also resisted the establishment of an independent regulatory authority. Power generation should be at least minimally a commercially viable activity but in India it is treated like a military undertaking where money and other resources are sunk for such intangible benefits as technological self-reliance, national prestige, etc.

Obviously, power generation and other peaceful, applications of nuclear energy can not be the sole aim. Our leaders are, of course, perfectly aware of this although they steadfastly maintain the public posture of peaceful uses. Occasionally, we get a glimpse of the truth such as when Rajiv Gandhi declared in Paris in 1985 : "If we decide to become a nuclear power, it would take a few weeks or a few months". Such a switch from peaceful use to warlike applications within "a few weeks or a few months" is possible because "peaceful use" takes a country nearly nine-tenth of the way to acquiring usable nuclear weapons.

There arc at present two routes available to operate a "dual purpose" nuclear technology which can yield energy or weapons or both. The first route followed by the US and many other countries uses enriched uranium in a light water reactor. Tarapur is one example of this. In this method, the uranium metal is first "enriched" by separating the fissile isotope U-235 from the non-fissile U-238 and increasing the concentration of U-235 to about 4-5% which is then used as a fuel in the reactor. This is an expensive and difficult technology but if mastered, it enables an enrichment to levels above 90%; this is weapons grade material.

India has taken the second route. This uses natural uranium and the reaction is moderated with heavy water. The two major advantages of **this method are that (a) it yields Pu 239 (U 238 is converted to Pu 239 due to irradiation); and (b) the reactor can be recharged with fresh fuel while in operation. Weapons grade Pu 239 can be produced by separating the Pu-239 chemically from spent fuel. This is a relatively cheaper method than the uranium route. What is more, a lesser amount of Pu-239 is needed than U-235 for making a-nuclear weapon. The plutonium route is, therefore, the preferred route for a clandestine weapons programme..**

Once fissile material has been obtained in . sufficient quantities, the identity between the peaceful and weapon production technology ceases. The production of the weapon itself is an area of explicit military technology; Rajiv Gandhi's reference to "a few weeks or few months" was about this part.

Nuclear power generation, particularly by the natural uranium-heavy water route, allows sincere declarations of "peaceful use" which can not be challenged on technical grounds. Similar declarations about the space programme also can not be challenged on technical grounds because rockets used for peaceful applications and warlike purposes are almost identical. Only the last stage differs in terms of pay load, guidance, re-entry capabilities and so forth. Until the two programmes are demonstrably married, it is possible to maintain with a straight face that both are devoted to peaceful uses.

But it is not all a matter of maintaining peaceful pretenses. The nature of nuclear fission technology is such that nuclear plants, even if they do not produce bombs, are themeselves bombs of a deadly nature. This is not only because they may blow up for some non-nuclear reason. They become bombs in the event of an enemy attack on them. Such an attack need not be one with nuclear weapons ;a conventional attack is just as deadly. Almost everything in a nuclear power station is

radioactive. The quantities involved ire many order of magnitude larger, than the radiation ' released by a bomb, (people have returned to Hiroshima and Nagasaki but decommissioned power stations must be entombed for' 2000 years.) Moreover, nuclear power plants are generally built in clusters; in that sense they are like nuclear ammunition dumps.

Modern conventional penetration bombs can break through thick concrete shielding. The Osiraq reactor in Iraq was destroyed by Israel in a conventional attack. Locating the nuclear power stations away from the border with a hostile country will no longer guarantee safety because long-range missiles are being developed or acquired by many countries and there is no real defence against them.

All in all, nuclear power plants, contrary to the pious declarations of "peaceful use", are not only dangerous in' themselves but they lend themselves to warlike uses. Moreover, they. are attractive targets for attacks, by an enemy who has no nuclear weapons but can convert the plants themselves into nuclear bombs on one's own soil. Why then is the fiction of "peaceful uses maintained It does not fool other countries. Perhaps the political leaders and their scientist allies believe that their ignorant fellow-citizens can be more successfully fooled.

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"Usual Occurences"

Acording to a report by the British Royal Navy, more than 700 "incidents" took place on British submarines powered by nuclear reactors during their first 16 years of operation 1962-1978). The "incidents" ranged from faulty routine tests and minor errors of seamanship to the kind of accident which nearly crippled HMS Resolution, a polaris submarine, at the Scottish submarine base of Faslane on the Firth of Clyde. The 'Resolution' incident was described as a "little fault" by the British Defence Ministry, but the Resolution's reactor was actually within minutes of "dis-figuration", the first stage of a core melt-down, before the crew succeeded in reactivating the cooling system. One of the crew members involved had to be scrubbed down for 24 hours after exposure to radiation resulting from the accident.

An analysis of 435 of the 712 incidents, carried out at the nuclear department of the Royal Naval. College at Greenwich, found that 205 accidents were caused by mechanical problems, 107 by operator error, and 123 by primary or secondary electrical faults, presumably not unlike the "minor electrical malfunction" which occurred on the Resolution. Captain Jim Bush, a nuclear veteran now working at the Centre for Defence Information, a private US think-tank frequently critical of Pentagon policies, estimates that perhaps a dozen of these incidents resulted in the release of radioactive material.

A typical submarine reactor can generate 70 million watts, enough power to run a city. However, safety measures for reactors at sea are not as strict as those for nuclear plants because danger to the public is considered to be less. At the British base at Plymouth, for instance, the safety-zone for any reactor accident is only 500 meters wide. To compound problems,'safety of the ship itself and the perceived need for speed and endurance leads those in charge of operation to maintain power

at **tea** in circumstances when a land-based reactor would be shut down.

The dangers caused by these "swimming reactors" have been neglected by the anti-nuclear movement for too long. The leading naval powers now have between them nearly 400 nuclear-powered warships. Canada, India and Brazil also have plans for nuclear powered vessels. In fact, in addition to the third of all nuclear weapons that are sea-based, more than half of the nine hundrded reactors on earth are somewhere on the seas.

The US Navy has already lost one nuclear-powered vessel and according to the Guardian (the British newspaper which released news of the Navy's report), the Soviet fleet has "almost certainly lost several in addition to an accident when missile fuel blew up Inside a nuclear submarine off Bermuda in 1986." Meanwhile, the Pentagon claims that "in over 3,100. reactor years of US naval reactor operations there has never been a reactor accident or a problem resulting in fuel damage." (The loss of a reactor along with a ship doesn't seem to. count as a "reactor accident"...) But according to William Arkin,. a defence analyst at the Washington-based Institute for Policy Studies, sources within the US navy admit to serious incidents in nuclear submarines, where crew members .have been hospitalised and submarines required to surface to deal with reactor problems. In relation to the Soviet fleet, Arkin estimates the rate of significant incidents at 200 over 10 years.

***Source : WISE News Communique* : 289.2940.**

NUCLEAR DUMPING

The Irish environmental organisation, Earthwatch, has called on the Irish government to use the London Dumping Convention to prevent Britain from dumping obsolete nuclear submarines off the south-west coast of Ireland. According to the Sunday Press (Ireland, 24 Jan. 1988), the British government is considering filling the submarines with concrete and dumping them, complete with their 850-ton reactor units, on the seabed.

The problem of what to do with old, nuclear-powered submarines is becoming ever more pressing. Britain's two Valiant Class submarines will have to be scrapped in the next four to five years and the four Polaris "R.' class vessels are due to be phased out in the next ten years. The most urgent, however, is the already obsolete 3,000 ton HMS Dreadnought, currently lying in **a** "secure berth" at Rosyth, on the east coast • of - Scotland.. - The as-year old vessel was formerly powered by an American-built pressurised water reactor, which is still on board. The alternative to establishing a radio-! active cemetery conveniently distant from Britain is to store it on land in Britain, a strategy which would also meet a lot of opposition. It has been estimated that the cost just to remove the reactor would be in the region of 15 million Pounds and this takes no account of the huge expense that would be involved in transferring it to a safe burial site-if such a thing could eves be constructed.

Under the London Dumping Convention, a moratorium on all dumping of radioactive wastes at sea was introduced in 1983. .However, the British government argued that the moratorium was non-binding and intended to go ahead with its dumping plans .for that year. At that time, the British National Union of Seamen refused to handle the waste. However, **a** union embargo would:not prevent.the.proposed dumping, of nuclear submarines, which

Would be carried out by tie British Navy.

Earthwatch is calling on the Irish government to seek international support before the next meeting of the London Dumping Convention (3-7 October 1988) for a fully binding moratorium on nuclear dumping. Already a proposal has been put forward by Nauru, a tiny Pacific island nation, calling for all radioactive substances to be placed on Annex I of the Convention. This is the so-called "black" list of substances, dumping of which is banned in all circumstances. As this would involve an amendment to the Convention itself, it would require a two-thirds majority of the countries represented.

According to Earthwatch, over 150,000 tonnes of radioactive waste has already been dumped at the North Atlantic dump site approximately 400 nautical miles to the south-west of Ireland. The most conservative estimates suggest that over 1,000 deaths, cancers or major genetic deformities among present and future generations will result from this waste, peaking in about 80 years.

John O'Halloran of the Irish National Cooperative . Council, which has also urged the Irish government to protest about the plan, believes that the dumping plan has been prompted by a recent medical survey of 60,000 Scottish children. Of 43 cases of Fife, twelve were in Rosyth, where HMS Dreadnought is berthed. Fifteen cases were found in the neighbouring village of Levenmouth.

An Earthwatch spokesperson said, "Dumping of nuclear waste in the oceans causes cancers and genetic defects among populations who receive none of the benefits of nuclear technology. Earthwatch believes that all radioactive waste should be stored on land in the country in which it was produced. The nuclear industry must face the reality of what it has created. The British proposal...is based on domestic political consideration rather than environmental or radiological criteria. Instead of reconsidering the ocean option, the British government should respond to the inevitable public opposition to land-based disposal by scrapping its nuclear programme.

Source : WISE News Communique.

•Half-Life'

The Marshall Islands are a part of a complex of 2000 islands in the Pacific that collectively comprise Micronesia, inhabited by 160,000 indigenous 'native' (Adivasi) people. During the second world war, these islands were occupied by the Japanese. After the war, they were taken over by the U.S. as U.N. mandate territories. Today, strategically they are important bases for the U.S. domination of the entire Pacific region. In addition since the first 'human testing' of the atomic bombs on Hiroshima and Nagasaki, the U.S. has used Marshall Islands in particular as a site to test its latest weapons of mass destruction. The same **is true of the French who first began nuclear testing in North Africa in early 1960 s. After Saharan independence the French just shifted their testing site to their possesions in the Pacific-Moruroa for example, where they continue their business as usual even to this day. The Americans justify their actions by pointing to the fact these islands are inhabited by only a 'few' people. As Henry Kissinger said, "There are only a hundred thousand people out there. Who gives a damn "**

Editor's Note : The same attitude is characteristic of all nuclear weapon's powers. It is also shared by exploders of 'peaceful nuclear devices'. Due

a the feat of 'fall-out' nuclear testing can only be done in very sparsely populated regions. These places are populated by Adivasis who anyway nave very little political voice - who don't count a damn. In fact, not only nuclear weapon's testing but the whole nuclear fuel cycle, from uranium mining to nuclear waste disposal is an assault on Adivasi existence. We shall document this in future issues of *Anumukti.*

Dennis O'Rourke, an independent Australian film maker has made a powerful film titled *Half-life.* It deals with the effects on the Marshall Islanders of the first U.S. open air hydrogen bomb test in 1954, code named "Bravo". He has used declassified U.S. documents and direct interviews with the personnel involved in monitoring weather conditions for the test, to show that the indegenous population was deliberately experimented upon and used as radiation guinea pigs.

For forty-eight hours the people on Rongelap island were told nothing about the radiation effects of this first 'dirty' hydrogen bomb. The children,, who had never seen snow, played in and with the white radioactive fall-out-snowflakes. Soon after this first exposure men, women and children started becomming sick. The U.S. medical and military authorities deliberately kept people in the dark, reassuring them that their land, waters, fishing and food were not contaminated. This, despite the evident symptoms of radiation sickness.

For three years, from 1954 to 1957, U.S. forcibly exiled the Rongelap Islanders to other islands in the region. They were permitted to return and 'live' on their island thereafter. Over the next years, the awful consequences of radiation contamination were passed on through the biological chain. Numerous women either aborted or had malformed children. Bven after their return in 1957, the Rongelap women still experienced a stillbirth and miscarriage **rate twice that of other Marshallese women who had not been exposed to the fallout. Of the twenty-two Rongelap children exposed to the fall-out, nineteen have had to remove thyroid nodules surgically. All the while the authorities were pretending that this was nothing abnormal.**

The title of O'Rourke's film aims to capture the fact that radiation effects last forever in nature. In physics and biology, a 'half-life' is a unit of calculation tor the period of time required for a quantity of radionuclides to break down by half. In reality however, calculating 'half-lives' is a way of institutionalizing permanently damaging effects. The film captures very well the destruction of the indegenous Marshall Island's culture by technological totalitarianism. It brings out the contradiction between two. incompatible ways of life. One based on imperial arrogance-your land is ours and that we have a right to dominate, manipulate and even destroy you, your resources, your relation to land and nature in our God-given interest, as we conceive that interest. The other based on a radically different, harmonious relationship with nature.

After suffering the irreversible physical and social effects of this radioactive 'half-life', the Marshall Islands' culture is no longer viable. Just as the natural soil, sea and water systems are in decay,so is their culture of integrated harmony with nature. In addition to the physical and biological effects of the 1950's tests which continue to this day, there are also equally traumatic psycho-social effects : the region's suicide rates, for example, are among the highest in the world. The people have no sense of meaning in their lives because they have literally been dispossesed, uprooted from the natural condition of existence. In particular, far from being able to sustain any form of natural economy, the people remain dependent-for their very existence on imported U.S. Junk - literally Coca-Cola and McDonald's hambergers. One of the

things to moving about 'Half-Life* is the portrayal of how, from defensive necessity, in order to survive, the indegenous victims have to adapt to these antinatural conditions.

In the United Nations trusteeship agreement under which the administration of the Marshall Islands'was handed over to them, the U.S. government had pledged : "To promote the social advancement of the inhabitants and to **this end shall protect the rights of and fundamental freedoms of all elements of the population without discrimination; protect the health of the inhabitants"**

Sources **: Interview of Patrick Flanagon by Jenny Dowell for the Barcelona periodical** ***Integral. (The Monthly Review*** **January '88)**

H.Wasserman & N. Solomon : ***Killing Our Own*** **Dell Publishers '82**

The Spirit of Belau

Belau is a group of about two hundred islands 8ooKm. east of the Philippines in the Pacific Ocean. Belau with a population of just 15,000 people has become famous for being the world's first nation with nuclear free provisions written expressly into it's constitution. But this is exactly the reason why this small Pacific island is no longer pacific.

Belau was a Japanese base during world war II. In 1947 it was placed under U.S. administration as a United Nations trust territory. It became a republic in 1979. It was the first country to have a nuclear - free status written in the constitution. The constitution was adopted by a 92% vote in a referendum. The clause guaranting the nuclear-free status could only be overturned by a majority of not less than 75 % in a referendum.

The Pacific Ocean has become a testing ground for nuclear explosions and missile tests in the last few decades. With the 'fall' of Indochina, the Philippines and Guam remain the only U.S. strongholds in East Asia. Among these, the fate of the bases in the Philippines whose status is being renegotiated is uncertain. There has been a rise in antinuclear sentiment in the Philippines and its senate has voted strongly in favour of a nuclear-free status. Thus, Belau-a tiny island with a small population, which can be pressurized easily, has assumed importance to U.S. military planners.

Unfortunately for them, the nuclear-free provisions in Belau's constitution **prevent the development of a base at which nuclear powered and armed ships can berth. However, such niceties have never prevented the military anywhere and especially the U.S. military from getting what it wants. To them, the Pacific Ocean has always been an American lake.**

Hence, since 1979, economic and political 'screws have been tightened' by the US. President Haruo Remeliik, who was a strong supporter of the constitution was murdered in March 86. The new president, Lazarus Salii declared a state of financial emergency and fired two thirds of the government employees without pay with the promise that they would be reinstated with back pay after the amendment of the constitution. Other pressure has included cuts in electricity, water and hospital services. The homes of several pro-constitutionalists have been fire-bombed. The referendums to amend the constitution have been held repeatedly (8 so far), Extreme right-wing organisations like the Unification Church and the World Anti-Communist League have extended their activities to Belau.

The latest referendum was held on August 4, 1987. in an atmosphere of mob violence. In it 71% voted for a constitutional amendment to eliminate the provision which said that a majority of 75% was needed to amend the constitution. So on 21st August 1987, a simple majority was sufficient to overturn the nuclear-free provision in the constitution,

The. legality of this referendum was challenged in the courts by a group of women elders under the leadership of Gabriela Ngirmang. This suit was, however withdrawn shortly due to intimidation of the plaintiffs and witnesses. Only after receiving assurances of protection from the U.S. congress, the suit was refiled in March '88. On April 23rd Judge Robert Hefner ruled in favour of the women elders and held the constitutional amendment invalid.

It is not known what happens next. As an American television commentator said, "if Belau is allowed to retain it's nuclear free status, it could spread like a virus throughout the Pacific and that would be against the U.S. national interest." The fight shall go on. The spirit of Belau lives on.

***Sources* : *Kalinga Senaviratne in Lanka Guardian X,* 20 (15.2. '88)**
***WISE News Communique no*.* 295, 293, 291, 290 & 278.**

Already Off The Brink ?

Little more than a year ago, in March '87, Dr. Abdul Quader Khan comprehensivly beat us 'all ends up' with a googly or was it a chinaman. Pakistan's Bomb was announced not with a bang but an interview. The spate of confirmaations, denials, counter-denials followed by border belligerance and cricket diplomacy was enough (as intended) to confuse almost everybody.

So, what is the situation with regard to the South Asian bombs Has the starter's gun already blown for the nuclear arms race in the subcontinent Unfortunately, as is the norm in everything about ourselves, one has to turn to foreign sources for information.

According to Mr. Leonard Spector, who has been compiling an annual report on the nuclear scene in the threshold countries, for the Carnegie foundation, the answer is yes.: there are bombs in the basements of both countries. Though neither country according to him has as yet taken any steps to 'operationalize' nuclear weapons.

Dropping a nuclear bomb from an aeroplane calls for special procedure. After zeroing in on the target area, the aircraft must go into a steep climb immediately after releasing the bomb and turn sharply backwards to escape the after effects of the blast. This being the case, any country planning to use bombers for this purpose would have to set apart men and machines for this purpose. Pilots will have to be selected for skills and political reliability. The earmarked aircraft will have to be segregated and specially protected. A special chain of command will have to be created between the ultimate political authority and the designated unit. Training will require dummy bombs exactly duplicating the size, shape and weight distribution of the nuclear device. It is doubtful if all this can be kept secret from several intelligence agencies which are undoubtedly looking for tell-tale signs. This suggests that neither India nor Pakistan has yet moved to the stage of putting nuclear devices into operational arsenals - unlike Israel which has certainly inducted nuclear weaponry into its armed forces. Mr Specter goes on to assure us that, "I would be surprised to find any Indian or Pakistani military personnel playing at this stage any role in nuclear preparations. The nuclear establishments in both countries are, so far, the only ones involved along with political authorities. My fear is that the current situation of a developed, but not operational nuclear capability wouldn't last". The ambiguity about what each has in mind may compel the other side to assume the worst, and take its own steps accordingly. This might create an unintended chain reaction which relentlessly pushes both beyond the nuclear threshold.

What does having bombs in the basement mean *i*

la India's case it means that work has gone on in refining bomb design - miniaturizing the warhead to permit fitting to a missile. The plutonium needed to make the bombs is already available in plenty and so is the knowhow to convert it into bombs. However, there is no hard evidence of a programme for the production of a nuclear arsenal. Some people though, in the U. S. intelligence community have suspicions that India is building at the rate of 20 bombs per year.

By mid 1986 onwards, weapon's grade enriched uranium first became available to Pakistan from the Kahuta enrichment facility. It is estimated that by early this year enough has been accumulated for four to six bombs.

Along with nuclear energy the other high-tech frontier area with lots of peaceful' applications is space **technology. India has already sucessfully tested its own indegenous surface to surface missile 'Prithvi' with a range of 250 Km. Pakistan has access to Chinese M-9 missiles which have a 600 Km. range. China has sold the missile to Saudi Arabia and has shown it at air shows with the purpose of selling to anyone interested. A marriage of these two 'peaceful' technologies is not difficult to arrange. It would mean that cities like Delhi, Lahore, Bombay and Karachi amongst others would be just a few minutes away from oblivion, with no other defense except the mutual good sense, maturity and the survival instincts of their respective political leadership. Good night and sweet dreams.**

Source : "South Asia's N-bombs not yet operational" by Dilip Mukherjee, Times of India July **8,1988.**

Anatomy of Nuclear War

The date August 6, **1945.** *The Place - Hiroshima, Japan.*

"No one could understand what had happened. Thousands began to flee the city. Most of them seemed to be hurt or maimed. Eyebrows were burned off, skin was hanging from faces and hands many were vomiting. Almost all had their heads bowed, looking straight ahead, were silent and showed no expression whatsoever. In general, survivors that day assisted only their relatives or immediate neighbours, for they could not comprehend or tolerate a wider circle of misery.

Towards evening the streets became quieter-, "Now not many people walked in the streets but a great number sat ana lay on the pavement, vomited, waited for death and died." Even now there was no organised help; masses were dead, masses were dying. "They all felt terribly thirsty and they drank from the river. At once they were nauseated and began vomiting and they notched the whole day'' There were a few people who were capable of helving otliers. Survivors that evening noted that the asphalt on the streets was still too hot to walk on with comfort. Two men noticed "a pumpkin was roasted on the vine", which was eaten. Potatoes under the ground were found to be baked and were gathered for food. Many desperately ill survivors found their way to the sand pits on the river deltas. The tide was coming in. Many were too weak to move themselves but were helped by exhausted survivors. "He reached down and took a woman by the hands, but her skin slipped off in huge glovelike pieces." Others were moved up the sand pit but the following morning they had gone as the tide had came higher than expected. Hiroshima, by John Hersey.

Today, with the "live" experience of Hiroshima and Nagasaki a great deal is known about the medical consequences of a nuclear attack. A nuclear bomb explosion involves blast effects, heat effects, and the effects ofionising radiation. The proportions of these effects can vary depending on the size and nature of the bomb. For example, in the neutron bomb (the 'capitalist' bomb which kills people but docs not damage property) the blast and heat effects are greatly minimised while the radiation effect is greatly enhanced. But in the 'normal' nuclear explosion, some 50 per cent of the energy goes as shock waves or other blast dffects, 35 per cent as heat and 15 per cent as radiation. The range of these effects will be different if the bomb bursts in the air (blast and heat range will be greater) than if it bursts on

the ground (radioactive deaths, fall out etc, will be greater) or whether it explodes underground or underwater.

A sufficiently high overpressure (blast effect) on the human body will lead to ruputure and haemorrhages in the lungs, air embolism and rupture of the gut and ear drums. In addition blast effects on buildings etc, will indirectly create many more human casualties through flying projectiles and falling debris etc.

The fireball of a nuclear explosion (small one) will lock brighter than the sun at noon to anyone within a 50-mile radius of the explosion. To anyone looking at the fireball there is great likelihood of retinal burns leading to permanent blindness. The intense heat of such a fireball will raise flash burns of the skin. A partial thickness burn leads to blistering which can became infected. A full thickness burn is where the skin is completely destroyed. In both cases loss of crucial body fluids through the surface of the burn can lead to death. In addition, the explosion will create fires on the ground leading to flame burns which will cause lung damage through inhalation of smoke from a variety of burning materials especially plastic.

After a nuclear explosion comes the radioactive fallout as radioactive isotopes condense on debris and dust to produce the radioactive dustcloud. In the first 24 hours some 60 per cent of radioactive products fall to the ground. This is the early fallout. The 40 per cent which remains can take much longer to fall and can be dispersed over a wide area depending on weather, winds etc. This is the delayed fallout. This radiation causes damage to rapidly dividing cells such as those of bone marrow and the lining of the gastrointestinal tract. When the whole body is exposed one can get radiation sickness which is often fatal. One unit of dose i.e. energy absorbed per unit mass is called a rad and a dose of 450 rads will kill 50 per cent of young, fit adults. A dose of 150 rads will kill 50 per cent of elderly, already ill and children.

In the first form of radiation sickness/the bone-marrow form requires only an exposure of 150 rads. The first symptoms are lethargy and nausea, then nothing for 10 days. Towards the end of the second week there is maximum depression of the white blood cells and plateles which reduces the blood's capacity to clot and stop bleeding or protect against infection. Spontaneous haemorrhages often develop.
By fourth week many of the victims will die.

If the radiation exposure is high enough then there will be gastrointestinal damage where the cells of the small intestine are damaged. This leads to massive diarrhoea with loss of body fluids, to greater risk of getting septicaemia from bacteria emerging through the damaged lining. If exposure is higher still, then the central nervous system of the body is damaged leading to convulsions, coma and death in a few hours, If the victim survives, there will be gradual loss of mental and physical faculties which then results in death in a few days.

Where radiation sickness does not lead to death, it can destroy or damage fetuses in pregnant women. Brain damage was found in many children whose mothers were less then 15 weeks pregnant in Japan when the bombs fell. Small skulls (microcephaly) occured in 44 per cent of surviving children and 16 per cent were severely mentally retarded. The pregnancy of stillbirths and post-natal infant deathe rose dramatically.

The longer term effects of radiation through delayed fallout affect those not directly affected by the explosion. In these cases, radioactive isotopes are ingested through contaminated foodstuffs and fluids, by inhalation and occasionally through the skin. Radiation-induced cancers apart from leukaemia (which ocurs more quickly) can emerge after a latent period of 20-25 years. Genetic abnormalities and defects can take a number of generations before emerging since gene nutations are recessive.

Even a single bomb of the kind used on Hiroshima and Nagasaki would completely overwhelm medical resources. Quite apart from the psychological damage or the direct/indirect effects of the explosion, there would be a great deterioration in public health standard with sanitation facilities wrecked and incapable of coping with sewage clearance, providing clean drinking water and so on. Thus diseases like dysentry, infectious hepatitis and salmonellosis would be promoted. There would be diseases of overcrowding, meningococcal meningitis, diptheria and tuberculosis, diseases associated with dirt and vermin such as typhus and in Indian conditions, even plague. Common infections like pneumonia and septicaemia would become killers.

All this would be the *effect* of a few explosions. The effect of a nuclear war is simply unimaginable. The indirect effects would be far greater then the direct effects and impossible to calculate. As far as the environmental damage e.g to the earth's ozone layer, leading to worldwide and devastating ecological damage e.g. freezing of the temperate regions, submergence of large land masses under water, destruction of a large part of the world's agriculture, excessive ultraviolet radiation as atmospheric protection is eliminated—these arc all part of what is now called the "nuclear winter" scenario which could become a reality even if there was a "limited' or "small" nuclear war in a remote part of the world.

In sum for *purely* medical reasons *alone*, nuclear war must never be allowed to occur. No government should contemplate it and it should never be allowed to happen no matter what the circumstances.

Why Nuclear Arsenals ?

Why then do countries go in for building nuclear arsenals ? Why then the insane nuclear arms race between the superpowers ? Why then the attraction that going nuclear has for bomb lobbies in countries like India and Pakistan, which have nuclear weapons capability but have not as yet crossed the nuclear rubicon of openly deloying a nuclear weapons system?

Nuclear war is mind-boggling but precisely because it throws into the dustbin older prceoneeived notions of war and its possible purposes, so many governments revert back to older forms of thinking in order to cope with the mind-boggling character of nuclear weapons. That is to say, these governments or these nuclear politicians or nuclear strategic experts try to treat nuclear weapons in much the same way as they try to treat and cope with conventional weapons—they try to make nuclear weapons into *viable instruments of a countrys foreign policy.* Since the uncontrollable dimension of nuclear weapons means that the use of nuclear weapons for political purposes is not viable (what possible political purpose can be justified by the use of such weapons?) what has become viable is not the use out the threat of its use. This is what is called deterrence. Having nuclear weapons becomes a way of assuring nuclear peace. Despite the universal character of nuclear weapons—its universal effects and the universal **honor at its use—this way of assuring nuclear peace is not the least universal in character or orientation but is strongly nationalist. Deterrence becomes a way in which a nation prevents nuclear war breaking out between itself and another nation having nuclear weapons by *intimidating* it. Thus the foundation of nuclear peace is nationalist intimidation and distrust.**

The great importance given to deterrence is ultimately a reflection of the bankruptly of those who have power in our societies. Nuclear weapons, as Einstein pointed out, should and must lead to a new way of thinking among human kind. Instead, very little has changed in the thinking of power elites. The best way to have nuclear peace say our tough-minded "realists" is to prepare for a nuclear war. What is more, if deterrence is to be credible, the possibility of a nuclear war at least a retaliation of nuclear attack must also be real. Thus, when governments say they do not believe that there can be any circumstances which justify the launching a nuclear weapons, thay are either wilfully lying or caught in an insoluble contradiction. If nuclear deterrence for a country's government is to be meaninful and credible, its willingness to launch nuclear weapons must be real in certain circumstances.

Deterrence, then, is a justification for the proliferation of nuclear weapons. There is both horizontal proliferation (more and more countries becoming nuclear weapons powers) and vertical proliferation (the superpower arms race and the other weapons powers adding to their nuclear arsenals). Both kinds of proliferation must be curbed. Such has been the insane logic of deterrence that both superpowers in the name of "national security" and "deterring the enemy" have embarked upon such a fast moving escalator of arms development and deployment, that both of them have enoromous "overkill" capacities. The end result of this search for nuclear security "has been ever greater insecurity vis a vis each other, and for the world". This is the historical balance sheet of all these years of nuclearly arming in order to keep the nuclear peace.

Finally, with the coming of Gorbachev in the USSR, there seems to be a chance (after three and a half decades of complete barrenness) of the possibility of the superpowers agreeing to a partial and limited disarmament in Europe.

redoubled their efforts to prevent any further proliferation. That left clandestine development as the only way out for nuclear ambitious countries.

The ambitions of such countries are difficult to check despite the best efforts. The first attempt came in the form of the Nuclear Nonproliferation Treaty; non-nuclear countries were induced to join it through a mixture of inducements and threats. But several refused to sign the Treaty giving highminded reasons. This was followed by the imposition of International Atomic Energy Authority (IAEA) safeguards on countries which wanted to build nuclear power stations. This regime was further reinforced by a group of 12 . countries coming together (informally called the "Club of London") which prevents the sale of nuclear materials outside the IAEA safeguards regime. All such efforts have registered only a limited success.

The most difficult problem about preventing proliferation is that the technologies for nuclear power generation and for producing weapon-grade fissile material are almost identical. While nuclear weapons have generally evoked feelings of horror, the generation of electric power based on the heat generated by a nuclear reactor has been largely accepted as benign and desirable. In countries such as India where the potential for developing coal or oil based thermal power or even hydroelectric power is limited, nuclear power generation is considered by some as the only way out if the growing energy needs of the country are to be met.

In recent years, nuclear power generation has been subjected to a great deal of criticism. The per kilowatt hour capital costs of nuclear plants are escalating rapidly. Safety has always been a problem but since the Three Mile Island near-disaster and the Chernobyl actual disaster, public anxiety about nuclear power plants has grown tremendously. The storage and disposal of nuclear wastes from the plants is **becoming a pressing problem as nuclear power stations grow in number and run for longer periods. Above all, some plants are now approaching the end of their useful life and the problem of decommissioning them have yet to be solved; even after 'entombment", they may have to be guarded for the next 2000-3000 years ! For all these reasons, ambitious plans for nuclear power generation are being cut down drastically in the industrialised countries. In 1974, the plans envisaged the production of 4.45 million megawatts of nuclear power generation by the year 2000. But now the projection has been cut down to 0.4 million megawatts or less than *10%* of the original target. Some countries are cancelling all the new plants on order.**

But the turning of the nuclear energy tide is taking place only in the highly industrialized countries. In the Third World, the expansion plans remain unaltered. In India, for example, the Atomic Energy Department is determined to go ahead with its plans despite horrendous cost-escalations, very serious time-lags, enhanced doubts about safety and the mounting problems of nuclear waste management.

If power generation were the sole objective, it can be achieved relatively quickly and efficiently by building the plants with foreign technology under IAEA safeguards.. This the Government of India has ruled out for future plants. The high-minded principle behind this is self-reliance and rejection of discriminatory teatment. These are laudable principles but they are evidently not applied to other sensitive areas. For instance, the high technology weapon systems in the armed forces are almost wholly imported. High-speed computers are imported despite discriminatory conditions.

If power generation is the only aim, why the tremendous secrecy surrounding the operations of the nuclear plants In fact, except for the locations of the plants and their generating capacities, no other important detail is made known. The size of the uranium stockpile, the

any such uncertain process. To establish a "credible deterrent" against China, India would have to embark on a crash programme of nuclear weapons development to make up the 15/20 year technological and deployment gap between the two countries as quickly as possible. Success in such an endeavour is by no means assured. But what can be assured is that such Indian 'efforts would greatly perturb China, and make it more willing to consider nuclear action or the threat of it against India. Such a move would also lead Pakistan to try and nuclearly "match" India and thus enhance the momentum of a regional arms race. There would be greater interaction distrust and hostility and above all, greater nuclear insecurity for the countries in the region—more and more insecurity in the name of the search for security. Nuclear security has to be a *common security* based on the virtues and strengths of disarmament not armament. It is the search for ways to disarm that hold the promise of a safer world not the search for how to use nuclear weapons **in the service of national real politic. The greatest tragedy of the nuclear era is the contradiction between the regionalisation/internationalisation of effects and dangers of nuclear war and nuclear arms races and the nationalised nuclear mind-set of those who are in a position to take crucial decisions concerning nuclear war and the arms races.**

While local and regional peace movements can play a vital role in promoting the *process of disarmament and sustaining its momentum, a world completely* and *permanently* safe from the Fear of nuclear weapons cannot be created by movements against nuclear weapons alone. Such a world requires transcending nationalism and national elites in the name of the universal interests of human kind. In short the struggle to create a truly and permanently nuclear free world is an intrinsic part of the struggle for socialism. Without a nuclear free world there will be no socialism. Without socialism there will be no nuclear free world!

Courtsey : Achin Vanaik, Radical Journal of Health Vol/I No. 4 March '87

Manuscripts, queries etc. should be addressed to :
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Rajghat Varanasi-221 001.
Subscriptions, donations, enquiries regarding circulation etc. should be addressed to:
Editor Anumukti,
Sampoorna Kranti Vidyalaya,
Vedchhi, Via Valod
District: Surat 394 641.
Editor: Surendra Gadekar
Printed at:
Bhargava Bhushan Press, Varanasi.-22/9. 88
We regret the late publication of this issue.

KAIGA CHALO

October 2,1988

Subscription Rates :—

Indian Subcontinent Rs. 25/year

Foreign U. S. % 15'year

PRINTED MATTER BOOK POST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol 2 No 2& 3 October & Dece' 88

WINDS OF CHANGE ?

Sometime in the beginning of this century, Gopal Krishna Gokhale remarked, "What Bengal thinks today, rest of India thinks tomorrow." Times Change. Today we live in the global village. What the Russian leadership thinks in the morning is well on its way to becoming the official Indian dogma before noon. Today's key word : GLASNQST.

Thus, after four decades of close-door operation, of being answerable only to the Prime minister, even the Department of Atomic Energy (DAE) has felt the need to justify its activities to the general public. As is well known, leopards do not change their spots. Neither do nucleocrats. Their prefered mode of educating the public has been to organise a series of lavishly funded seminars entitled "Atoms for Peace, Power and Prosperity." In these tamashas more than half the time is spent on enunciating the various uses of radioisotopes in nuclear medicine, agriculture, pharmaceuticals and the like. Not a word is said about the fact that all the radioisotopes used for these many purposes, come from the research reactors in Trombay and have nothing to do with the real reason behind these public relation exercises - the need to 'sell' the vastly expanded programme of power generation.

The "National Workshop on Nuclear Power with Special Reference to Kalga" held in Bangalore on December 10 and 11, was in stark contrast to these stage managed exercises. Organised by the Karnataka state government, it allowed for almost equal time between the antagonists and the protagonists of nuclear power. The workshop - the first of Its kind to do so - heralded the coming of age of the antinuclear movement in India. It showed rather Impressively, that even on narrow technical grounds, the antinuclear spokespersons well able to hold their own against the best 0 that the nuclear establishment can offer.

The major demand voiced at Bangalore was for free and unrestricted access to information. To a very limited extent, this demand was conceded. The Indian atomic anergy chief, Dr. M. R. Srinivasan agreed to make available reports on some nuclear establishments. This piecemeal approach is not enough. What we need and need right now is free and easy access to all Information. The 1962 Atomic Energy Act is a disgrace. No 'peaceful' programme need hide behind its cloak. For Glasnost to be more than a mere buzzword, sections 3c, 7 and 18 of this infamous act need to be scrapped forthwith.

AN APOLOGY

This issue of Anumukti Is appearing after an inexcusably long delay. Circumstances conspired to play a cruel Joke. There were deaths in the family, pressure of other work like the National Workshop *of* Kaiga and finally we had to shift our residence from Varanasi to Vedchhl. We deeply regret the very late publication of this double issue. Readers will hopefully also excuse the very dated appearance of some of the articles.

DISASTROUS DRILL

If the way things went at Tarapur during the disaster management exercise of the Tarapur Atomic Power Station (TAPS) on October 8 are any indication, then the residents of the surrounding village did a wise thing by fleeing. It is another matter that the Department of Atomic Energy (DAE) ex udes confidence on the infallibility of the TAPS reactor.

The whole exercise has brought to light that in case and DAE officials do not fail to stress that there won't be a "in case'!— of a radiation leak at TAPS, only providence can save the farmers and fisherman of the Palghar taluka of Thane district, 120 km away from Bombay.

However, the blame for the failure of the exercise has to be shared by the DAE, the district administration and the state government. Also the various agencies under them proved how incapable they would be In case of a real disaster.

The seriousness of the whole exercise was ignored and it was with an air of lightheartedness that the entire drill was conducted. So much so that an Atomic Energy Regulation Board (AERB) observer, who was on site along with scores of other observers, remarked, "Saturday's TAPS exercise was a sort of a mela."

A colorful tent, tea, cool drinks and a lunch session was spread out for officials of various organisations, local and an overdose of the local press corps, along with a few from Bombay gathered at the site. Absolute chaos and confusion prevailed.

The AERB official further pointed out that, according to regulations, the first man to be in charge of the situation once a site emergency is declared should be the TAPS superintendent. And the man to take Over from him the moment an off-site emergency Is declared should be the Collector of Thane district. However, while it was required of TAPS superintendent, K. Nanjudeswaran, to sit In the emergency control, room (ECR) set up at the Environmental Survey Laboratory, 14 km away from TAPS, till the arrival of the Collector he was out for most of the time in the mela, the AERB observer alleged.

Thane Collector G. B. Pingulkar was informed of the disaster at 8.15 pm, when the off-site emergency was declared. He reached the ECR at 10.50 am. This considering that it was an emergency. Pingulkar seemed to be going about the whole thing as if he was attending just another function where he was asked to perform the role of the chief guest.

Apart from the essential presence of these officials, the participation of the locals during the drill was also lacking. The panicky villagers, in the midst of the melee, had "evacuated" themselves.

There were many reasons for the panic, the main being disinformation. It was quite important that the message of the drill and its necessity be brought home to the common man. This message percolated down: but in an unexpected fashion.

The Collector claimed to have met about 500 teachers from the five villages, specially chosen for the exercises, and explained to them that there was going to be a drill. After that the teachers were supposed to have Informed the students who on their part, were to inform their parents. But the whole procedure failed.

The TAPS officials themselves were unsure about the distribution of an emergency information pamphlet which seemed to have caused more fear among some villagers who laid their hands on It. While some TAPS officials said that the pamphlets - in English and Hindi - were not meant to reach down to every villager but only upto the sarpanch level who in turn would explain It to the villagers'xerox copies were available with some villagers who could not understand it.

Another slip-up on part of the officials with regard to the pamphlet distribution was the illustration of an owl on the pamphlet with the heading "Words to the wise: Be prepared." Among the villagers, an owl is regarded as an omen of calamity.

The exodus started on September 5, three days before the drill. The first to leave were the comparatively affluent people of the villagers, and the poor followed them.

On September 7 morning, TAPS officials visited the villages. A village elder of Unbhat claimed that one official had stated : "We will release some gas. for about 10 minutes, but nothing will happen."

On September 6 and 7, police vans mounted with public address system went round the villages announcing that there was nothing to worry and "Strict action" would be taken against rumour mongers.

But by now the people became more suspicious and panic had set in strong.

More rumours made their way into the villages. One was that there would be a Bhopal type disaster. The villagers also had Chernobyl in mind, a disaster they had come to know through television.

The local press corps also added fuel to the fire and disinformation, such as five people killed after falling out of overcrowded trains, and 95,000 tickets sold at Boisar railway station, were also reported. Local villagers also blamed some of the Palghat fortnightlies for creating panic.

Inspite of the warning, there were a few who stayed back to "guard their houses". A woman said, "One day we all have to die. I want to die here."

Since then, people have started returning to their houses. They are cursing the government, TAPS and all other connected with the drill. The attitude prevailing in the villagers is that the next time there is a drill, they wont run away.

Courtesy : Shrikant Shenoy, The Indian Post I7/1088

RUN, RABBITS, RUN

On October 8, 1988 the country's nuclear authorities organised an emergency drill at the Tarapur Atomic Power Station (TAPS). The evacuation drill was designed to train the population in the villages in the vicinity of the reactor on how they should respond In the case of a nuclear accident.

The experiment failed. In advance, Much before it was even tried.

As The Indian Post reported in its edition of October 9, "over 80,000 people from several villages around the TAPS deserted their homes and fled the area after **a** drill scheduled for today gave rise to rumours about an Impending radiation leak."

All Indian nuclear reactors are anyway candidates for "impending radiation leaks." So when "concrete" rumours of such a leak surfaced (no matter that this was actually a "hypothetical" leak), nobody wanted to take a risk. Certainly not with the kind of nuclear experts we have in service.

Time **and again** In the twentieth century, the public (whether literate or Illiterate) has demonstrated, that the best thing to do in circumstances where hi-tech hazards are Involved, Is not to waste time listening to reassurance from experts, but to flee like the rabbits in the Adams **novel, *Watership Down.***

In the case of TAPS, more than 60 percent of the villagers turned out to be unbelievers in the assurances deployed by Indian nuclear experts. Bus stations and railway platforms were packed with people getting out of the area. Schools and shops were shut, streets deserted.

India looked on at Bharat in chagrin, and fumed.

They shouldn't have been that surprised. Aren't we soon going to commemorate 4 years of the Bhopal gas tragedy, which alas we have almost forgotten as an event. But who will forget "Operation Faith" which turned out tobe another exercise in faithlessness ?

Operation Faith was the slogan given to the official effort to get rid of the remaining MIC in the storage tanks of the Union Carbide plant The man who coined the phrase " Operation Faith" was none other than Chief Minister of MP, Arjun Singh, whose immense faith in Union Carbide had earlier got him more than Rs. 2 lakh from the company for children's trust controlled by his family members In his hometown. But this kind of faith rarely moves mountains. The public in the days prior to "Operation Faith" did the best thing It could : it bolted. Shortly thereafter, even the copywriters of the operation lost faith : they hastened to bring in buses from the mofussil areas to transport those who wanted to get out of the old city.

At the Union Carbide plant, the men we were supposed to have faith in were actually only pretending to run the show. Dr. Varadrajan and Co were basking in the media headlines, announcing daily decreases in the storage levels of the stored MIC. But two things were happening which everyone knew.

First, despite the government decision to shut down the factory permanently, the company was being permitted to convert the MIC into sevin, which the company would still dispose in the market.

Two, the scientists were not really in charge. If they had been, the entire city would have fled. Imagine untrained persons operating such a complicated (and run-down) plant. Union Carbide people operated the plant, as they had always done. But it was put across as an effort at "detoxification". What a nice label for what was actually nothing more than the old process of sevin manufacture.

So why should the public have faith in liars, politicians and crooks ? In those who practice and participate in deceit ? Arjun Singh said that to allay fears he would himself be within the factory during the "detoxification" process. Ordinary villagers murmured that he would flee by helicopter the first sign of trouble and the scientists with him, leaving them to their helpless fate.

Perhaps, one is making too much of all this. This Is India, and we Indians tend to over react. Is this true ? Take the Three Mile Island disaster. It wasn't really very much different there either.

At the Three Mile Island atomic plant in Harrisburg. in March 1979, a pump driving water to a steam generator packed up, setting in rapid motion a bewildering sequence of events that ended In a partial meltdown of the core, and the creation of massive bubble of hydrogen within the reactor (1000 cubic **feet In size).**

Had the bubble exploded or expanded further, a full meltdown of the core would have been inevitable. The scientists were unable to do anything about the bubble. Eventually, after a number of terrifying days the bubble reduced in size of its own accord.

During the crisis, the Harrisburg public was given the option of staying on or moving out at the utility's expense. I don't know much of the education levels of the townspeople of Harrisburg, but I presume these are at least a little higher than those of the villagers of Tarapur or Bhopal. The US Is after all an advanced country. So how did the Harrisburg townspeople react ?

As at Bhopal during Operation Faith, people in Harrisburg preferred to run rather than stay. Nobody had faith either in the capacity of the men to control their machines or in the assurances of the experts that nothing would happen.

Neither at Chernobyl, or at the Sandoz chemical factory in Basel (Switzerland) or Bhopal plants or at Harrisburg, did the experts know what the hell was happening. The malfunctions commenced, events moved totally out of control and relief came only after the process had run out of steam on its own. At Bhopal, the MIC exhausted itself, at Sandoz on the Rhine a similar pattern was repeated. Similarly at Chernobyl.

There are two major reasons why experts have begun to stink. The public now acknowledges that experts generally have tunnel vision and stunted minds. Earlier, the expert could pretend that his expertise in one field automatically equipped him to talk authoritatively on any subject. Now that seems a distinct disadvantage. If one Is still forced to rely on expert assurances for survival, one also opts wisely at the same time for insurance cover.

But the other reason is more significant. And that is that experts are as shifty as weathercocks. The Government of India for instance knows that the state of scientific knowledge is such that one set of experts can always be relied upon to underwrite whatever decision it wants to take for extraneous, undisclosed reasons. Experts today are not merely flexible and pliable, they are In addition expert in lying. In order to protect their salaries and privileges, they may even sell the nation down the nearest sewer.

Examples there are galore. Take the experts from the dairy sector for instance. Once we required experts to say that there was nothing wrong in getting free imports of milk powder from the EEC for Operation Rood. It would have no economic consequence, they said. Now that we are purchasing milk powder from the EEC market, and are hooked onto such commercial purchases for good, those experts have done the vanishing trick.

This year we required experts to state that there was nothing wrong in using radioactivtly contaminated butter given free by the EEC for Operation Flood. We got them. They even got together for a national seminar on "Public Health Aspects of Radioactivity In Dairy Products- in New Delhi, and proceeded to give us sermons on how the milk was safe. Nobody would enlighten us on how we had landed ourselves in a position In which we were being forced to drink radioactive milk even while every other Third World country from the Philippines to Bangladesh had refused. Not for nothing that many people preffered to go without milk altogether.

Finally, consider the case of the Silicon con. Experts after experts said we needed foreign collaboration in silicon technology because the country's demand for the material (for use in photovoltalcs and electronics) would be 200 tonnes by 1990. So we went In for collaboration with Hemlock, USA. Then we cancelled that, paid Hemlock millions of dollars as punishment, and decided on the advice of experts to get Indian made silicon. Then the same group of experts certified that all that India actually needed now was only 40 tonnes of silicon. Why ? Because this was all the Indian sector was capable of. In the process, the country lost its option to learn to make electronics grade polysilicon. When the government wanted experts to state that Indian technology was adequate, it got a committee to do that too.

So the villagers living In the shadow of TAPS were acting purely In their self-interest, and quite rationally too, when they heard that our experts were going to simulate a nuclear emergency. Since modern science is bound to explode and erupt, time and again, for the most humdrum reasons such as falling motors and dumbfounded computers in socialist and capitalist environment, it is best to take all precautions. After all, as we found at Bhopal and Chernobyl, those who design these monsters, our scientific and technological experts of the 20th century, have only one course of action to recommend when such disasters commence: a wholesale reliance on physical flight. Run, rabbits run!

Courtesy: Claude Alvares

THE MAZE OF NUCLEAR MYTHS

The Indian nuclear programme began early. At the time when Hiroshima and Nagasaki were lust two obscure Japanese towns, Bhabha had dreamt the nuclear dream. Nuclear energy was to be the vehicle to launch an Independent and self reliant India Into the the modern age.

Four decades on, the time has come to take a second look. Nuclear enterprise has given rise to a very rich mythology. Nuclear arguments, which have **a** habit of shifting ground, often leave the uninitiated lost in the maze of myths. Let us examine some of the myths one by one.

"Pinnacle of Scientific Achievement"

Mastery over nuclear power is the key to scientific sophistication." The future belongs to science and to those who make friends with science."(Jawahar Lal Nehru) Nuclear technology may have problems - all technology does. Mankind has met all previous challenges to existence. So why doubt now?

The terrible and awful demonstration of the power of the atom at Hiroshima and elsewhere has implanted this myth very deeply Into all of us. But the very relentlessness of the scientific advance has left it somewhat in tatters. Specially since the late seventies, high energy prices have encouraged dramatic improvements In hundreds of energy technologies. Many technologically advanced nations, which had trudged much further down the nuclear road than India are now making vigourous efforts to extricate themselves. Thus, going nuclear In a big way today, Is not a sign of technical sophistication but rather its very opposite.

The threat posed by nuclear technology to human survival is far greater than that posed by any previous technology. Nuclear power uniquely combines several different threats. The process of nuclear fission itself produces some of the most toxic substances known. Miniscule quantities of these have been shown to cause cancers and genetic abnormalities. All the processes connected with nuclear technology - the entire nuclear fuel cycle - produce huge (order of tonnes) amounts of these toxins. There Is no solution to the problem of disposal of nuclear waste. Thus the threat is not only from (the a catastrophic accident due to human fallibility ala Chernobyl. There Is the possibility of deliberate sabotage of a nuclear facility by a deranged operator. (This actually happened in 1961 In U.S.A.) or, like Kyshtym in the Soviet Urals (1957), there is the chance of an explosion in a nuclear waste dump which can devastate hundreds of square miles. On the top of all this is the perpetual threat of nuclear war between nations and nuclear terrorism by subnatlonal groups. A technology that can end the world both by a bang and a whimper.

Breaking the vicious Circle of Poverty

Development - Growth - Ever increasing energy use

Energy - Electricity - Bulk generation + Grid distribution

The only sources that need to be considered for bulk generation are coal, hydro, oil and nuclear. The sources of all except nuclear are limited and geographically maldistributed. Hence, if the hungry millions are ever to be fed, nuclear energy is a must. Q.E.D.

All the steps in this argument are questionable and some are patently false. By now, it is well documented that the fruits of development seldom reach the poor while the thorns Invariably do.

Domestic fuel is the biggest contributor to the real energy crisis facing the country today. This crisis urgently needs a solution, it is the cause both of deforestation as well as decline in soil fertility through the burning of cow dung. Producing more and more electricity is no solution to this problem at all. Energy-wise, electricity is the most Inefficient way of cooking food. Nuclear power, which can deliver energy only in the form of electricity is thus no answer to the real needs of the rural poor. In fact, because of the massive diversion of resources it entails and the very long construction times of nuclear infrastructure, nuclear energy is one of the causes of the present energy crisis.

Nuclear resources are far more scarce and limited than other resources. While the coal deposits within the country are sufficient to last hundreds of years at present rates of consumption, the uranium deposits would be hard put to last another fifty.

"Only Source for the Future"

"True, our uranium resources are limited and of poor quality. But in a programme based on the fast breeder reactors, they along with our very vast thorium deposits can sustain a very enhanced (350.000 megawatts as compared to the present 1,000 megawatts) power generation capacity. We already have a prototype fast breeder reactor in development at Kalpakkam."

There is many a slip between the prototype and the lip. The trouble is that nobody has as yet run a commercial scale fast breeder reactor successfully. The French programme, which is the most advanced, is in doldrums. The environmental and safety Implications of the breeders are many times more horrendous than the already horrible enough problems of the conventional reactors. The electricity they might produce is also likely to be many times more expensive.

Besides, the past performance of India's nuclear industry gives no cause for optimism regarding its abilities to deliver on its promises. in 1962 for instance, Bhabha had projected a nuclear generation capacity between twenty and twenty five thousand megawatts, for the year 1987. The actual Installation of Just over a thousand megawatts Is an indication of the magnitude of failure on the performance front. Teething troubles' are the perpetual excuse for poor performance. Fast breeders which have yet to be properly born, are certain to have their share of 'teething troubles'. Hence, It is a sure bet that this mantra will often be invoked by the next generation of nuclear technocrats.

" Indian Scientists are Second to None "

" We have done it all by ourselves. There have been problems and delays, but the lessons learnt have been invaluable in our march to self sufficiency and mastering of nuclear technology. it is an achievement the nation can justly be proud of."

As a proud member of the Indian scientific community myself, I know, that in fact we are second to none. But do the big shots of the nuclear establishment know the same? With the fast approaching advent of the 21st century, they have developed cold feet. Otherwise, they would not have acquiesced to the insult delivered to the self esteem of the entire Indian nuclear community. By signing the agreement for the import of two Russian built reactors and by negotiating with the French for the Import of two of their reactors, the political leadership has expressed its no-confidence in the abilities of Indian nuclear technologists. It is a mater of shame that this humiliation has invoked no public cry of protest and the nuclear establishment is willing to fritter away the hard won benefits of self reliance so casually.

" **It Can't Happen Here** "

" There is no free lunch. People die in coal mines. Large dams can suddenly fall killing thousands. Think of Bhopal. The chances of a large nuclear disaster are mlnlscule. There are now more than 400 reactors operating safely all over the world. Only 32 people died at Chernobyl. And In any case, Chernobyl cannot happen here since our technology is different, we have double containment and we use graduate engineers instead of high school pass people as operators."

The overwhelming majority of the victims of radiation disasters die unknown, isolated from each other in both space and time. This makes it possible for nuclear propagandists to continue this barrage of bilge. Independent scientists have estimated Chernobyl's human toll at around a million cancers, half of them fatal and more than half of them outside the Soviet Union The financial toll of the disaster, which is less subject to dispute, stands at an astronomical $14 billion. It is an awesome warning that even a single major nuclear accident could completely ruin the entire Indian economy.

Accidents have been taking place more frequently than the schedule chalked out for them by nuclear risk analysts. The fact that our reactors are of a different design, does not make them fool-proof. A study conducted in the wake of Chernobyl, concluded that reactor designs in operation all over the world had shortcomings. Given the 'right' errors and even graduate engineers have been known to make errors - these design shortcomings could lead to disasters, double containments or no double containments.

Too Cheap to Meter "

The economics of nuclear power is a subject which closely resembles magic. Research costs, insurance costs and all the social costs vanish without a trace. Nobody yet knows what the decommisionisng costs are even likely to be. The costs of waste storage for thousands of years are donated for kind rememberance to our children. And the costs that are Included in the calculations have a surreal quality. The Comptroller & Auditor General's office (CAG) recently commented on a strange practice It observed In the heavy water plant at Tutlcorln. The cost of the heavy water produced calculated by the Department of Atomic Energy turned out to be Rs. 4120 per kg. as compared to Rs. 13800 per kg. estimated by the CAG. Investigations revealed that achievable Instead of actual production figures were used in cost computations. After all this, one gets a statement like, " Our calculations show that while the nuclear power plant at Kalpakkam produces electricity at the rate of 48 paise per kilowatt hour the thermal power plant at Tuticorla produces electricity at more than 60 palse per Kilowatt-hour." Applause.

In countries which allow a freer flow of market forces, economic compulsions have already spelt the doom of nuclear industry.

"Well Within Internationally Accepted Safe Limits."

" The radiation releases from our nuclear establishments are well within the Internationally accepted safe limits and there Is no danger to our workers or to the people in our neighbourhood. Just look at the greenery around our establishments. We have not only maintained the environment but significantly improved It."

No other group of internationally renowned experts have fallen flat on their collective faces as often as those belonging to the radiation community. There was a time when the ICRP (International Committee for Radiological Protection) believed that there was a 'safe' threshold level of radiation exposure, below which the radiation was harmless or may be even beneficial. In the 1960s It was forced to admit that there is no safe threshold - the risk of radiation simply increases with the dose received. Thus the so-called 'safe' limits are In actual fact 'acceptable risk' limits. However, as the ICRP already concedes, the limits presently set are far too high. The latest revaluation of the Hiroshima data left the ICRP on other choice. They have however, as usual, delayed action on setting a newer, lower limit by two years. Even Britain, a country not particularly distinguished for the zeal of its nuclear officials in protecting public health, has already lowered its radiation dose limits.

The Myth of the 'Peaceful Atom'

This is the one myth which everyone knows to be a myth. Hence the great demand that it be publically rejected and the country embark upon a programme of building a nuclear arsenal. In all this jingoistic talk one point gets invariably lost. We have already exercised the nuclear option. The nuclear facilities have already been built. They await the enemy's pleasure. Israel, by demolishing the nearly completed Osirak reactor in Iraq by conventional bombing, has demonstrated to the world, the vulnerability of reactor containments to high penetration bombs. Nuclear facilities, seen **in this** light, **are** more In the **nature of** massive nuclear time **bombs** or ammunition dumps **awaiting** detonation.

"I, a mere Individual, can do nothing"

The most immobilizing myth of all. This monstrous programme continues because you and I have done nothing to stop it. Edmund Burke put it well long ago: " All that is necessary for the triumph of evil is that good men do nothing."

S.N. Gadekar

BENEATH THE VENEER OF PROGRESS : A SICK INDUSTRY

At 1.00 on the morning of May 26, 1988 the Long Island Lighting Company and the State of New York reached an extraordinary settlement. The utility agreed to sell Its completed but never operated nuclear plant at Shoreham to the State for one dollar, while the State promised to permanently close the $ 5.30 billion facility and grant the utility rate increases intended to save it from bankruptcy.

To one not familiar with the current status of nuclear power, the Shoreham saga has an Alice In Wonderland quality. How. might one wonder, could nuclear planners have sited a plant in a densely populated part of Long Island, and then pushed the project forward despite overwhelming local opposition?

How could the original schedule of construction have been missed by more than a decade and the budget by more than $4 billion? How could a private company have tied its very survival to the completion of a single power plant whose cost exceeded the value of all Its other assests? And how could the Nuclear Regulatory Commision have allowed a utility to load radioactive fuel into plant unlikely to ever get a full operating license, an act that will add hundreds of millions of dollars to New York' s expense for decommissioning Shoreham?

The Shoreham case is extreme, but it Is symbolic of the problems currently facing unclear power. It Includes colossal mismanagement,cost overruns and fierce political battle's that pit citizens and local officials against government bureaucracies commited to expanding nuclear power.

Two years after the Chernobyl accident, the political and economic tide around the world is running strongly against nuclear power. Nuclear power has become expensive, its growth has been mismanaged, and an increasing number of citizens are rejecting It. The daunting problems of nuclear waste disposal and nuclear materials proliferation grow ever more Indomitable as governments fall to come up with solutions and the materials themselves accumulate.

Despite the lack of such solutions, some officials are now calling for a revival of nuclear power. The new Impetus: global warming and other environmental threats caused by the world's reliance on fossil fuels. The world's current energy trends are beginning to undermine the health of the environmental system crucial for humanity's survival

As governments and international agencies look for alternatives to oil and coal, nuclear power Is once again presented as a candidate. Societies are now in danger of banking on a new generation of nuclear reactors without fully understanding the enormity of problems that ruined the last generation.

A Decade of Setbacks

When disaster struck the Three Mile Island nuclear plant in March of 1979, the global nuclear industry was running at full throttle. New plants were being built at a record pace, governments were almost universally In favour of nuclear power, and public acceptance of these plans was unquestioned. Three Mile Island, however, was the first In what would be a series of setbacks for nuclear power. Now, almost ten years later, the nuclear programmes of nearly every country have been touched by the ripple of doubt set off by that accident and the one at Chernobyl.

At first glance, It would seem that nuclear power has continued to flourish in the past decade. Generating capacity for example, has risen fourfold to 290,000 megawatts. But beneath this veneer of progress is a sick Industry that is getting few new orders and In many countries Is clearly winding down.

In the United States, Three Mile Island was a pivotal event. As the pioneering nuclear nation, the U.S. had by far and away the world's most ambitious nuclear programme In 1979. Yet, not a single nuclear plant has been ordered In the United States since, and 108 have been canceled, Including all those ordered after 1974. The U.S. business magazine Forbes has called the failure of the U.S. power programme "the largest managerial disaster in U.S. business history," Involving perhaps $100 billion in wasted investments, cost overruns, and unnecessarily high electricity costs.

The U.S. nuclear construction Industry has for the most part disappeared, and the pipeline of new projects is nearly empty, sustained only by a handful of plants that are a decade behind schedule on average. It now appears that the nuclear share of U.S. electricity production will peak no later than 1992 - at something less than 20% and then begin a slow decline as older plants are retired.

It was economic more than political or technological failure that doomed nuclear power in the United States. As with the Shoreham plant, most U.S. nuclear facilities completed In the eighties are grossly uneconomical, providing power that is five times as costly as that from plants completed a decade ago.

Hundreds of changes introduced to make nuclear power safer have added billions of dollars to costs. The industry attempted to blame regulators for requiring expensive change, but it is clear in retrospect that the changes were needed to help avert accidents that would have caused the nuclear industry even greater damage.

Europe After Chernobyl

Advocates oi nuclear power often argue that the *VS.* nuclear programme Is beset by problems of little relevance to the rest of the world. The supposed strength of nuclear power throughout Europe and much of the rest of the world is often held out as evidence that If nuclear managers and regulators would simply clean up their acts, the problems would soon be resolved.

As attractive as this argument may seem, It is belled by the declining fortunes of nuclear power across a wide spectrum of countries - from Western democracies to the Soviet Union and the developing world. A process of gradual attrition during the eighties has mushroomed into a massive rejection of nuclear power since Chernobyl - more for political reasons than for technological or economic ones.

In Europe several countries have made formal commitments to shut down their nuclear programmes In the wake of Chernobyl. Months after the Soviet disaster, Austria abandoned its only nuclear plant, at Zwentendorf - a plant that like the one at Shoreham had never been operated. Greece decided at about the same time to scrap plans to build Its first nuclear plant.

After a protracted political debate that contributed to the collapse of two governments, Italian voters decided in March 1988 to block the expansion of the country's already stalled nuclear programme. Two months later, under Intense political pressure, the Italian government decided to stop work on the country's only remaining nuclear construction project, at Montalto dl Castro, leaving three completed reactors operating Intermittently. Though not quite officially dead, Italy's nuclear programme shows few remaining vital signs.

Early In 1988, the government of Belgium, which is already heavily nuclearized decided to indefinitely postpone expansion plans. The Netherlands, which has no large reactors, has also canceled Its plans.

Switzerland, which has not completed a nuclear plant since 1980, decided this year to cancel 22 - year old plans to build the country's sixth nuclear facility at kalseraugst. Swiss voters will decide later this year whether to abandon the country's nuclear programme.

Scandinavia's nuclear programmes have also been moving In **reverse.** Finland, with a substancial nuclear capacity, Indefinitely postponed expansion **plans after** Chernobyl. Sweden decided In a **1978** referendum to phase out nuclear power by 2010, despite the fact that nuclear plants supply 40% of the country's electricity. The Chernobyl accident forced the government to firm up these plans by scheduling the shutdown of the first two plants in 1995 and 1996. Denmark and Norway, meanwhile, have reaffirmed their vows never to develop nuclear power.

Europe's second and third largest nuclear power programmes remain in a state of Umbo. Nuclear opposition has flourished in West Germany since Chernobyl, further weakening the already remote possibility of the country's building additional unclear plants. Several state governments and the major opposition party In the federal parliament **are** vehemently opposed to nuclear power.

In Great Britain, the Thatcher government got to work on a nuclear plant at Sizewell after It concluded an eight year debate in 1987. Should this plant be followed by Several more, Britain **will still be hard-pressed** to outpace the scheduled retirement of nuclear **plants** In the nineties.

France meanwhile remains Europe's pronuclear holdout. Four more plants were completed In 1987, leaving the country with a nuclear capacity second only to that of the United States. Nuclear power now supplies over 70% of the country's electricity.

But even France's nuclear programme Is plagued by a growing number of technical malfunctions. In the spring of 1988, one plant at Flamanville lost its cooling capacity twice, a plant at Nogent sur Seine released radioactive steam, and several other plants were closed due to radiation leaks. France has so far avoided a Three Mile Island or Chernobyl-style debackle, and It Is uncertain whether the pronuclear consensus would survive such an event.

The more obvious problem In France Is too much nuclear capacity. The country has been forced to sell electricity to neighbouring countries at bargain prices and to run its plants at reduced capacity. The gap will grow larger as another ten plants come on-line in the next few years. Frances nuclear expansion has been slowed to less than one plant per year, a level Intended Just to barely support the government owned nuclear manufacturing Industry.

The French state utility **has** built up an enormous debt of $39 billion, which continues to grow as high-cost nuclear electricity Is subsidized so as to encourage consumption and justify the Investment. Nuclear power has helped reduce the country's oil Import bill, but It has also tended to starve other parts of the French economy of Investment capital.

Second Thoughts in the **Soviet** Union

Prior to Chernobyl, the Soviet nuclear programme - third largest in the world - was generally thought to have avoided the morass of political problems that derailed programmes in the West. The Soviet government maintained a firm commitment to nuclear power In building an Industry that supplies \\% of the country's electricity.

Since Chernobyl, the Soviet nuclear consensus has broken down. Top Soviet officials regularly contradict each other as to the status of nuclear power and the capacity of the Soviet Industry to manage it. The cleanup at Chernobyl has not gone well, and the total cost of the accident is now calculated at $14 billion - nearly three times the original estimate.

Meanwhile, rumours of radiation related sickness continue to circulate In the Ukraine, and citizens report a general sense of tearfulness and unease two years after the accident. Public confidence has been further undermined by reports of subsequent mismanagement at the remaining Chernobyl reactors, breaches serious enough to require disciplinary action against key officials.

Such stories have fueled an outburst of antinuclear protest throughout the Soviet Union Indeed, Soviet press reports indicate that all of the country's operating nuclear plants face local opposition, as do most of those being built. Even in the era of Glasnost, such protest betray a remarkable degree of dlsquite with government policy. Some local officials even used the occasion of the landmark Soviet Communist party conference in June to call for the abandonement of particular nuclear plants.

The most vociferous protests, not surprisingly, emanate from the Ukraine, where Chernobyl is located. Both the Ukrainian Writers' Union and the Ukrainian Academy of Sciences have drafted a "manifesto" condemning the policies of the Ministry of Atomic Energy. Antlnulcear petitions demanding a change of course have circulated at Moscow State University and the Crimean Agricultural Institute.

Soviet nuclear officials have stuck to their pre-Chernobyl plans, agreeing only to phase out production of reactor design used at Chernobyl. Nuclear capacity in the current five year plan is scheduled to advance by a substancial 40,000 MW towards the goal of supplying 21% of Soviet electricity by 1990. This target, will almost certainly, not be met. In the past year an obvious gap has opened between official plans and reality.

In May 1987, It was announced that the two additional units planned at Chernobyl would not be built. Then in November a high Soviet official conceded that citizen opposition had forced a halt to construction of two more nuclear plants, one near Odessa and the other near Minsk. Later that month the Ukrainian council of Ministers halted construction of a plant south of Kiev. In January 1988, the Krasnodar plant In the Caucasus was also stopped, reportedly dueto seismic dangers that had been neglected earlier.

It is impossible to read this litany of setbacks without suspecting that the Soviet nuclear programme is in the process of coming seriously unglued. The growing cost of safety measures in the aftermath of Chernobyl will likely cast further doubts on the efficacy of nuclear investment.

It is only a matter of time before the current, unrealistic five year plan for nuclear power Is revised downward. Portions of the Soviet scientific community now seriously question the nuclear programme, and an important faction of scientists and economic planners now favour an alternative approach to energy policy - In the direction of efficiency, renewable resources and decentralized power generation.

The Shifting **Case** for **Nuclear Power**

As nuclear power programmes continue to slip into oblivion the question remains whether countries can afford not to have nuclear power. Many key officials think not. Valert Legasov, who headed the Soviet commision that investigated Chernobyl accident, has stated that "the future of civilization is unthinkable without the peaceful use of atomic energy."

This line is nothing new from the pronuclear camp. Although they have remained stalwart in their conviction of the necessity for atomic power, many nuclear advocates have Justified It by repeatedly shifting among various arguments. In the sixties, nuclear power was pressed as an Inevitable next step in the technology of energy systems. Few problems were seen as beyond the reach of scientists, and it was assumed that nuclear power would be inexpensive If not actually "too cheap to meter."

In the seventies, nuclear power was seen as an essential alternative to dwindling oil supplies, not without its own problems, but essential to stave off economic collapse. Now, In the late eighties, with oil prices down and nuclear power programmes in disarray, nuclear advocates have become environmentalists, urgently arguing that only nuclear power can ease acid rain, global warming and other threats posed by heavy use of fossil fuels.

The "technological inevitablity" argument was first to go. Since the late seventies it has become clear that that evolution of an energy technology does not necessarily have to take a nuclear path. High energy prices have encouraged dramatic improvements In hundreds of energy technologies, ranging from more-efficient oil refineries to less-expensive solar power.

During the past fifteen years, for example Improved energy efficiency has saved far more oil than has nuclear power. Many countries now persue the long term development of hydroelectric and wind power, solar energy and biomass fuels as an alternative both to oil and nuclear power. Whatever the arguments for its development, nuclear power must now be fairly weighed against its alternatives.

Using nuclear power to fuel the economy on a large scale is possible only if it is affordable.

And the best evidence available indicates that investing in nuclear power has become a risky proposition, in the United States, where financial reporting requirements are the strictest, the latest generation of nuclear plants has proven to be decidedly uneconomical. These plants cost more than three times as much to build as equivalent fossil fuel plants, and significantly more than a number of renewable energy facilities, Including wind, geothermal and blomass-flred power plants. As other power generating technologies evolve, nuclear power's financial disadvantage only widens.

Operating costs - an area In which nuclear power has traditionally enjoyed an economic advantage - are also growing malignantly. The equipment must be repaired or replaced far more frequently than was supposed. Recent surveys in the United States indicate that real operating the average nuclear plant than it does to operate a coal plant-including the cost of coal. A study by the U.S. Department of Energy suggests that some plants have become so costly to operate that it may be more economical to retire them early than to continue operations. Even writing off the $5.3-billion Shoreham plant may in the end turn out to have been a **wise** business decision.

At the root of these enormous cost escalations is a technology whose complexity defies human management and leads to continuing, unpredictable changes In equipment and operating procedures. Even in countries, where regulatory pressures have not been **as** Intense or public opposition as vehement, cost overruns have become endemic.

When planning a nuclear plant today, It is impossible to know how much it will cost to build, how much It will cost to operate, how long it will last, or what it will cost to decommission. This is the kind of Investment that only a government or utility would make, and even they are now generally investing elsewhere.

As an alternative to oil, nuclear power's potential is also severely constrained. While nuclear power generation did substitute for oil-fired generation in Europe and Japan during the late seventies and early eighties, the power sector's use of oil is now extremely low, offering little potential for further displacement.

Throughout the world, the major claimants on the world oil supply are automobiles, trucks, buses and Industrial plants, Improved efficiency offers by far the most effective means of displacing oil in these areas.

False Hope for the World's Climate

The environmental argument for further nuclear **expansion is** at first glance more compelling **than the** other two. Continuing expansion of **fossil** fuel combustion is now causing ecological havoc around the world. Air quality in most of the world's cities continues to deteriorate, particularly in developing countries, and air pollution carried over long distances has damaged at least 22 percent of Europe's forests.

As serious as these problems are, the ultimate limit to future energy growth may lie with the earth's climate. Scientists now believe that the 5.4 billion tons of carbon being added to the earth's atmosphere each year from the combustion of fossil fuels is contributing to Ireversible climate change. Average global temperature have already increased by about 1 degree Fahrenheit during the past century, according to a U.S. government-sponsored study published in the spring of 1988.

Global warming has begun, according to the best available scientific evidence, and climate models suggest a 9-degree rise by the middle of the next century, a faster warming than the earth has ever experienced. This would be sufficient to upset weather patterns, damage agricultural output, raise sea levels and expose humanity to wrenching change. With population expanding rapidly and the world food system already stretched tight, societies would probably find it impossible to adapt to such sudden change.

New scientific evidence along with severe droughts and heat waves in several countries this summer have lent a new urgency to the problem of global warming. In this light, many policymakers around the world are reassessing nuclear power. An International conference of scientists and public officials, meeting in Toronto, has called for a worldwide effort to cut fossil fuel use by 20 percent by 2005. Nuclear power was one of the energy, sources the conferees suggested reevaluating for its potential to combat global warming.

Some argue that a few Cheraobyls would be a small price to pay head off global warming. Unfortunately, this Is the kind of thinking that has misled nuclear planners In the past. Nuclear power is beset by problems that go well beyond its propensity for occasional accidents. Technologically, economically and politically, nuclear power faces a series of obstacles that will prevent it from coming close to displacing enough fossil fuels to significantly delay global warming.

Analysts at the Rocky Mountain Institute, a nonprofit research organization In Colorado, have developed a nuclear scenario that reduces global warming by 20 to 30 percent by the middle of the next century through the substitution of nuclear plants for all coal-fired power plants. They found that this would require the completion of one nuclear plant every one to three days during the next 40 years. Many countries would be almost blanketed by nuclear plants, and the total cost would run to as much as $9 trillion.

A nuclear power program of this scale would require not just a reversal of a worldwide trend, but a program of nuclear construction that is ten times as large as any the world has seen. Such an effort Is unthinkable, both economically and politically. Indeed, a democratic government that tried it would most likely soon be voted out of office.

Most nuclear technologists agree that a new generation of "inherently safe" reactors will have to be developed before nuclear power expands, even modestly. If governments were to throw their support into research and development programs large enough to accomplish this, It would be after the turn of the century before the first of the commercial reactors could possibly by Installed

Were such a program carried out, it would contribute virtually nothing to the 2005 goal of the Toronto conference, and would contribute only a small part of what is needed by 2050. One problem is that power generation is only part of the reason for global warming, and displacing a substantial part of even this use of fossil fuels would require an Inpossibly large investment in nuclear power.

Toward a Viable Energy Strategy

As the world faces the problem of global warming, it is important to come to grips with the timing of the problem. The earth now appears to be warming at a rate of about 1 degree Fahrenheit per decade, and because of time lags in the process, we are already committed to a significant increase of 3 to 4 degrees. Therefore, immediate action is needed to head off a catastrophic warming during the next several decades.

Nuclear power is clearly Incapable of making a meaningful contribution during this period. The global climate would be undermined before an Improved technology could even be tested, a fact that many nuclear advocates seem to be unwilling to confront.

Improved energy efficiency, however.does have the potential to reduce the projected warming in 2050 by up to half. Such a scenario requires that energy efficiency be improved by 2 percent per year beginning immediately. The technologies needed to accomplish this are at hand, and they can be economically installed. However, policy reforms are needed If we are to continue the enormous efficiency improvements made during the past decade.

ln the long run, of course, societies will have to develop energy sources that replace the fossil fulse on which we rely so heavily. There are really only two alternatives: nuclear power or renewable energy sources such as solar, wind and blomass. Since the seventies, energy policymakers and analysts have been debating the question of which path to follow. The global warming problem adds new urgency to this debate but does not make the answers any easier to come by.

Renewable energy technologies have advanced rapidly during the past 15 years of research funding, and many are being used commercially on a fairly large scale. They have a long way to go before being ready to provide the predominant share of world energy, but it is quite possible that before Improved energy efficiency begins to reach technological limits in the middle of the next century, a diverse mixture of geothermal power, wind power, blomass and solar energy will have picked up the slack.

Nuclear advocates believe that a new generation of nuclear technologies will be ready (or mass deployment as well. This is certainly an arguable point. Technological evolution is notoriously difficult to predict. However, societies are likely to find that nuclear power continues to fall short of Its proponent's dreams and that It In the end faces technological, economic, and political limits that are far more intractable than those confronting renewables.

I Projection of Worldwide Nuclear Power Generating Capacity

1 Source and Year of Projection	* 1980	Projection For 1990	2000
		(thousand megawatts)	
International Atomic Energy Agency			
1972	**315**	**1,300**	**3,500**
1974	**235**	**1,600**	**4.450**
1976	**225**	**1,150**	**2.300**
1978	**170**	**585**	**1.400**
1980	**137**	**458**	**910**
1982	–	**386**	**833**
1984	·	**382**	**605**
1986	-	**372**	**505**
World Watch Institute			
1988		**320**	**360**

Source : International Atomic Energy, Agency, Annual Rreports *(Vienna 1972-80); IAEA.* Reference Data Series No. 1. *Vienna, September 1982, IAEA,* Nuclear Power: Status and Trends *(Vienna : 1984-86); World watch Institute.*

Nuclear power requires increasingly centralized energy systems and intense safety measures and security systems. Renewables are by nature diversified, decentralized, and based on relatively safe technologies. Although renewables will cost large sums to develop, they have the advantage of being more politically palatable according to public opinion polls.

Most major governments have managed to skirt this central question by funding development **of** both nuclear power and renewables. The broad trend has been away from nuclear power and toward renewables, though the latter still receive a smaller share of most budgets.

The question now is whether to continue the current approach or to attempt to accelerate the development of either nuclear or renewables. There is no simple answer to this question, but if the lessons of the past decade and a half mean anything for the future, attempts to resuscitate the nuclear option will yield political friction, economic waste and serious accidents, not a solution to the global warming problem.

Courtesy: Christopher Flavin : World Watch, July-August '88. Christopher Flavin is vice president for research at the WorldWatch Institute and author of the 1987 Worldwatch Paper "Reassessing Nuclear Power: The Fallout From Chernobty".

SOVIET REACTORS FOR INDIA

In anticipation of the flnallsation of the India-USSR inter-governmental agreement on the supply of two 1000 M We nuclear power units by USSR, India concluded recently an agreement with the IAEA for implementation of safeguards In respect of these nuclear power stations. According to Mr. K. R. Narayanan, the minister of state In the department of atomic energy, the safeguards agreement, signed on September 27, 1988, was broadly similar to those in respect of the Tarapur atomic power station and the Rajasthan atomic power station. According to the minister, the safeguards agreement Inter-alla provides for IAEA safeguards for all nuclear fuel used in the reactors supplied by the USSR. The reactors will be under IAEA safeguards till the IAEA, India and the USSR jointly determine that the reactor in question is no longer usable for nuclear activity relevant from the point of view safeguards. In addition, it provides that safeguards on spent fuel will terminate in case it is transferred to the Soviet Union.

Different Reply

A study of the agreement in question reveals that the reply given by the minister differs sharply from the provisions of the agreement. The safeguards applied by IAEA are far more stringent than any accepted by India so far. They require safeguards on:

i) The reactor facilities supplied by the Soviet Union to India under the agreement, *and the reactor facilities produced therefrom or as a result of their utilisation;*

il) Any nuclear material supplied by the Soviet Union to India for use of the reactor facilities;

111) Any nuclear material, including subsequent generation of special material, produced, processed or used in or by the use of any other items referred to In this section;

iv) Any other Item required to be listed in the Inventory referred to in section 6.

The main part of the inventory listed in section 6 of the 100 safeguards agreement is more or less a reiteration of the above. The subsidiary part of the Inventory also listed In section 6, Includes 'any nuclear facility while containing, using processing or fabricating any nuclear material referred to In the main part of the Inventory.' The list is broadly similar to the list outlined In the safeguards agreement in connection with the supply of heavy water from the Soviet Union, except for the underlined item in (1) above and another section of the safeguards agreement, section 5, which states, 'in the event that India should construct or operate reactor facilities, as defined in the section 1 (d). It shall arrange to submit such reactor facilities to agency safeguards before such construction or operation commences.'

These two taken together require that India should place under similar safeguards all reactors, based on the Soviet design, constructed in future in India, Irrespective of whether these were constructed with foreign help or by indigenous efforts as a result of the experience gained with the use of the currently supplied Soviet reactors. Thus India has, In effect, agreed to perpetuity and to pursuit clauses not only in respect of the Soviet supplied reactors but also in respect of ail reactors of the same design that might be built in India.

For comparison, if a similar clause had been part of the safeguards agreement In respect of the Rajasthan atomic power station, we would have had to put under safeguards not only RAPS but, in addition, the Madras atomic power station, the Narora atomic power station and all the CANDU-type atomic power plants that are being constructed or planned in India. Few would deny that such an agreement would have been a setback to Indian efforts towards self-reliance In the nuclear field. Yet in response to a question whether the latest safeguards agreement Is a setback to our goals of self-reliance, the minister replied in the negative.

There can be no doubt that the current safeguards agreement is a far more restrictive one than any India has agreed to so far. In fact, If a similar agreement had been entered Into by India In respect of the other power reactors, TAPS and MAPS, then for all practical purpose India would have been under fullscope safeguards. It Is true that the reprocessing plants and the heavy water plants would not be under safeguards. But since by virtue of the safeguards agreement all power reactors would have been covered by the perpetuity and pursuit clauses, all the nuclear material used, produced, processed in these reactors Including subsequent generations of special fissionable material would have been under safeguard and we would have had to put the future generations of breeder reactors under safeguards as well.

In fact, the implication of the minister's statement that the Tarapur and Rajasthan atomic power station safeguards agreements were broadly similar is Itself a misleading one. The RAPS agreement was a far more restrictive one than in the case of TAPS. As a matter of fact, there has been a steady deterioration, from the Indian point of view, in the terms the safeguards agreements, four in all including the latest one, that India had concluded with the IAEA.

Special Agreement

The first safeguards agreement was signed in January 1971 and was in respect of the Tarapur atomic power station. The agreement with USA regarding TAPS was a special one, since the nuclear fuel for TAPS was supposed to be supplied exclusively by the U.S. The safeguards were applied on the reactors at TAPS; any nuclear material, equipment or device transferred to India by the US; Any special material produced in India in, or by use of, materials or equipment or devices transferred to India; and any facility while it is containing, using, fabricating, or processing, any special nuclear material transferred to the government of india for, or special material produced at the Tarapur atomic power station.

In practice this meant that in addition to TAPS, fuel elements and the spent fuel, the nuclear fuel complex and the Tarapur reprocessing facility were under safeguards while they contained material to be used or used in TAPS. The agreement did not cover the second and successive generations ol nuclear material obtained by the use of the spent material. In any case, It was expected that the spent fuel would be returned to the USA The safeguards agreement thus Included the perpetuity clauses but not the pursuit clause.

In agreeing to even such a limited safeguards agreements the Indian government stated explicitly that,' the government of India emphasises, in contrast to the position of the United States, that its agreement to the provisions of this article In relation to equipment or devices transferred pursuant to the agreement has been accorded in consideration of the fact that, as provided In this agreement, the Tarapur atomic power station will be operated on no other special nuclear material than that furnished by the government of United States and special nuclear material produced therefrom in consequence of which the provislons of this article In relation to equipment or devices in any case ensue from the safeguards on fuel.

In spite of such explicitly stated provisions, India found It difficult to break away from the agreement when the USA refused to supply fuel to TAPS. Eventually, of course, the agreement was transferred in favour of France which continues to supply fuel to TAPS and the safeguards agreement remains In place.

Similar Agreement

Soon after the first agreement, India signed a second safeguards agreements with the IAEA September 1971, which was in connection with the Rajasthan atomic power station. This agreement was somewhat similar to the TAPS agreement. The safeguards were to be applied on all nuclear material used or produced In RAPS. In addition to the nuclear material, the heavy water supplied by Canada was also under safeguards for a period of five years only, since upon the completion of the five year period, such heavy water was supposed to be removed from the scope of the agreement by retransfer from India to Canada or by substitution in accordance with established procedures.

In addition to this, the safeguards agreement stipulated that, 'nuclear material produced by the use during the aforesaid five-year period of such heavy water, and all subsequent generations of nuclear material produced in or by the use of such material, shall be subject to the implementation by the agency of the safeguards provisions.' Here we have the first application of the pursuit clause. However, In this instance it was limited to only a five year period during which the heavy water supplied by Canada was to be used In RAPS.

After that period, if India had used domestically produced heavy water in RAPS, the safeguards were to be applicable on only the spent fuel produced in RAPS but not on the subsequent generations of special fissionable material pro duced by the use of this spent fuel. More specifically, If India had used the plutonlum extracted from the spent fuel to fuel Its breeder. So In the second agreement there was a perpetuity clause and a limited period pursuit clause. A slight retreat from the first agreement but still acceptable.

THE Pokhran explosion altered the situation dramatically. With the withdrawal: of Canada from the project and with the domestic production of heavy water far behind schedule, India had to look for other sources of heavy water. Finally a third safeguards agreement, second with respect to RAPS, was signed with IAEA when the Soviet Union agreed to supply India with required heavy water. This agreement went far beyond the first two. The safeguards were to be applied to : heavy water supplied by the Soviet Union to India; any nuclear material, including subsequent generations of special fissionable material, produced, processed or used In the Rajasthan Atomic Power Station or in or by the use of any other facility while containing, using or processing any of the heavy water or any nuclear material under safeguards.

Thus perpetuity and pursuit clauses were applied to RAPS reactors, the heavy water supplied by the Soviet Union and all nuclear material used, produced or processed In or by the use of any item under safeguards. The scope of this agreement was far beyond anything even considered in the first two. Fortunately, the agreement was restricted specifically to RAPS and the heavy water supplied by the Soviet Union. Thus when India built and commissioned with indigenous efforts the Madras atomic power station, it was not covered under any safeguards agreement. The significance of this achievement should not be underestimated.

Unsafeguarded Facilities

There are currently five non-nuclear weapons states that have unsafeguarded (facilities of significance for safeguards, (Brazil, India, Israel, Pakistan and South Africa). Of these only India has so far managed to build and operate nuclear power stations without outside help and thus outside safeguards. In the remaining countries all their nuclear power station, either operating or under construction, are under safeguards and the Indian nuclear power programme did not envisage any further safeguards on any future nuclear power stations. At least till now. With the latest agreement, India has committed itself to subjecting, not one nuclear power station, but a whole class of nuclear power stations to safeguards. No amount of indigenous efforts can help us In breaking this stranglehold of safeguards. Now it is true that the wording of the agreement leaves some scope for manoeuvre in future, but that can sill lead to disputes and arbitration, a course of action full of uncertainty and pitfalls. The costs involved In the current course of action far outweighs any benefits that we can get. The benefit is 2000 MWe. The costs are politically far more. The current agreement falls just one step short of fullscope safeguards, something which we have been opposing consistently sofar.

In the international arena this question of full-scope safeguards has been a bone of contention between the nuclear weapon countries, alongwlth a number of developed countries and few developing countries especially Brazil and India. Some 137 countries have signed the NPT which, In effect, calls for fullscope safeguards. Among the non-nuclear states that have not signed the NPT. eight have significant, operational or planned, nuclear activities in their countries. These are : Argentina, Brazil, Chile. Cuba. India, Israel, Pakistan and South Africa. In five of these states unsafeguarded facilities of significance for safeguards are either In operation or under construction. Among these five, only India has serious civilian nuclear programme calling for substantial investment In nuclear power generation.

Internationally the efforts of the IAEA have been directed towards either bringing these unsafeguarded facilities in these non-nuclear states under safeguards or restricting the growth of such unsafeguarded facilities. Towards the latter end, the IAEA has been continuously strengthening its safeguards conditions. In the earlier years Its efforts were directed towards applying safeguards on specific installations or nuclear supplies. Later they began to apply the safeguards on installation and nuclear aterial.

The Tarapur and the first Rajasthan agreements belong to these types of safeguards. The safeguards scope was then expanded to Include pursuit clauses In Its totality. The second Rajasthan agreement is an example of this kind. Still the efforts were directed towards specific Installation. In the early eighties It began to adopt a different strategy. With the example of India, which had begun to build series of nuclear power stations on Its own but based on an Imported design In mind the IAEA began to insist on safeguards being applied on a whole series of, built, under construction or under possible construction, nuclear facilities.

Vandellos Plant

When in April 1981. Spain signed an agreement with IAEA in respect of the Vandellos nuclear power plant, the safeguards agreement called for safeguards on only the Vandellos facility along with safeguards on all nuclear material used or produced by the use of Vandellos facility Including subsequent generation of such material. However, when a couple of months later. In July 1981. Argentina approached IAEA for a safeguards agreement in respect of the Atucha II nuclear power plant, IAEA Insisted on applying safeguards not only on Atucha II but on "any nuclear facility designed, constructed or operated In Argentina on the basis of or by the use of the technological Information transferred from the Federal Republic of Germany to Argentina contained in design drawings, technical specifications, technical manuals for the operation and maintenance of the Atucha II Plant.

With this stipulation, the IAEA prevented Argentina from following India's example of building of similar reactors on its own and keeping them free from safeguards. The strategy was clearly to prevent the country from expanding its Inventory of unsafeguarded facilities, the underlying idea being that If you cannot get a country to either sign the NPT or accept full-scope safeguards, expand the safeguards conditions so that with a single agreement a large number of facilities can be brought under safeguards. In case of Atucha II the terminology was specific. In the present agreement that india has signed, the IAEA has used more general terms, it is Interesting to speculate whether this would result in a wider coverage than the Atucha 11 or a narrower one. In any case what Is Important Is the fact that there Is a fundamental conflict between the alms and objectives of the IAEA and India. The IAEA's aim is to get as many Indian nuclear facilities as possible under its safeguards coverage, thereby circumventing India's objections to either signing the NPT or accepting fullscope safeguards. India's aim Is to develop its indigenous nuclear capabilities with as little international safeguards, as exemplified by the NPT, as possible The present agreement is a clear victory for the IAEA. What Is not clear Is why the Indian govern ment and nuclear establishment agreed to con cede such vital principles to the IAF.A.

CHERNOBYL, CHELIYABINSK AND KOODAMKULAM

Glasnost and the Evasive Soviet Nuclear Industry

The civil and military nuclear establishment of USSR has even today remained as an island untouched by the social audit being Initiated under Glasnost. The civilian nuclear reactors produce 10% of the nations electricity. The military wing would become redundant if the peace talks succeed.

The Common Interest of the Nuclear Energy Lobby.

It has been argued that the USSR fully cooperated with the International Atomic Energy Agency (IAEA) and the governments of other nations in sharing the Chernobyl data. Such sharing with IAEA and nuclear establishments of other countries who all share a common bond of secrecy is of little relevance to the people. IAEA and the nuclear establishments of its member countries are promoters of N energy and as such any Information which questions the safety or economic aspect is anathema to them. Critical data like the probable health costs of an accident are neither sought nor given In IAEA gatherings.

Secrecy over nuclear matters is not a Soviet syndrome. Writes Stephanie Cooke, formerly managing editor of *Nucleonics Week and Nuclear Fuel :*

> It is an International masonic order of its own, with roots that lie in industry's birth place : the top security labs that produced the world's first atom bombs. (1)

None of the existing medical literature on radiation caused health hazards has originated from the scientists on the payroll of N energy establishments anywhere. The studies on environmental contamination and health effects In the western nuclear nations by independent scientists show that even under normal functioning, nuclear power is harmful for the entire life support system for many a generations. (2)

In the USSR, because of the support from the party and the state, the nuclear establishment retained monopoly over data and research. There was no visible anti-nuclear movement and counter-information base till Chernobyl.

The glut in Internal market ?

Opposition to nuclear power is gaining momentum In the USSR after Chernobyl. Construction work on six nuclear plants has been stopped. Other East European nations also are less enthusiastic now.

The Soviets first proposed to sell reactors to India during the early eighties. This has been frozen because of the full scope safeguards which would mean that the supplier would have control over the plutonium produced In indegenous reactors as well. This clause Is being reportedly diluted and the terms and price now offered are better than the earlier offer.

Did the USSR decide to do so because of a glut in reactor market in USSR and the Eastern Europe ? Before the transaction takes place, there should be a popular debate in both the countries centering the following issues :-

> Is it safe from a public health point of view, even under conditions of no Chernobyl type accident ?
>
> Is the reactor under negotiation relatively safer than the models involved in Three Mile Island and Chernobyl ?
>
> Has proper environmental Impact assessment been made before selecting the site for the proposed plant ?

This debate could begin with the limited and extremely fragmentary data on N Power in the USSR published in Soviet and international media. Here we will examine two cases : 1. the status and efficiency of N power industry in USSR which addresses Itself to the question of relative safety of the reactor under negotiation. 2. The response of the Soviet and International N establishments to two serious accidents In 1957 and 1986.

The Soviet Nuclear Industry

A UK Green Peace report quotes from Soviet newspapers about the bottlenecks in the nuclear construction programme:

> Chronic shortages of manpower, housing and materials have dogged most of the nation's nuclear sites and reactor manufacturing sites for more than a decade. The three large nuclear construction sites in the Soviet Union - Smolensk, Chernobyl and Leningrad-suffer from serious shortage of key materials........

it is reported that only 10% of the 1430 tons of steel required to meet 1980 construction goals was delivered to the Chernobyl site. In the first quarter of the

year, the plant was undersupplied with

> 6,500 cubic meters of reinforced concrete structures, hundreds of Kms of electrical cables and 12,000 ancillary equipments. No welding cable was sent In two years. (3)

Sovietsakaya Rosslya In a 1982 report quoted Nicholal Derkovitch, the then construction chief of the Balkavo nuclear reactor : "we ask for 12 millimeter sheet and they give us 20 mm. which is heavier and more expensive. When they give us 12 mm Instead of 20, of course we cannot work. Instead of giving us steel, they're giving us the finger, if you will pardon the expression. And as a result, we are violating every normal rule of construction technology." (4)

Eight years before the Chernobyl, Nikolai Dollezhal had complained about the low quality of materials supplied:

> "the equipment delivered by plants must be nuclear class, as it has now become the custom to say. It is not possible to say that all is well in this respect. Although legalised standards and rules for the design and manufacture of equipment for nuclear power plants have already been In existence for several years, observance of a high technological level in production is not always satisfactory." (5)

Atommash

The Atommash, planned with an annual production capacity of 8 VVER 1000 reactors was supposed to be the show-piece of Soviet reactor technology. A new city was created at Volgadonsk, the meeting place of the Volga and the Don. Construction work started in 1972 under Italian collaboration. The reactors manufactured at the 10 Km long assembly line would be towed by barges up the Volga to Central Russia or down the Don to markets through out the Southern and Eastern Europe. The Green Peace Report says:

Atommash has been dogged by difficulties for many years. Originally It was scheduled to be In operation by 1980. It missed this deadline badly. In the 11th 5year plan (1981-86), Atommash was projected to supply a modest seven 1000 MW WER reactor to Soviet sites. But by late 1981, officials said a maximum of four might be provided. (6)

The mess at Atommash did invite the attention of politburo. In 1983, Vladimir I Dolglkh, CPSU secretary for heavy industries rebuked the Atommash management for "having for a number of years failed to observe approved technological procedures, for gross violation of state discipline, for gross deviation from design standards and for failing to insure the accident free operations of engineering communications." Deputy Prime Minister Ignatl Novlkov and Gennadi Fomln, Chairman of the State Committee on CMI constructions lost their jobs. (7)

Atommash is reportedly In more serious troubles. According to a New Scientist report by Zhores Medvedev, Its heavy foundations began to give way In 1983. ..walls collapsed and serious accidents stopped the plants operation. Reason : the three giant structures - Atommash, Energomash (heavy Industrial complex supplying steel for Atommash) and the city of Volgadonsk were built well below the level of the artificial 1080 Sq. Mile Tsimlyanskoye Sea. Since the exploratory bore holes were drilled too vide apart, the large underground cavities beneath the plant went unnoticed. These cavities we e filling up with water from the sea. The water table in the entire area has risen sharply in recent years, undermining all the three units.

The soviet scientists were toying with the idea of protecting the structure by freezing into permafrost the groundwater ladden soil of this temperate region. According to Medvedev, this is highly impracticable "the only real answer Is to transfer the plant, lock stock and barrel to a new firmer location." (8)

Safety Consciousness in **India and the** USSR

Several safety lapses on the part of Indian atomic establishment have come to light. Narora, where two 235 MY/ reactors are coming up is a seismic zone and IAEC claims that an earth quake will have no effect on the reactor. Chairman IAEC quotes the example of Soviet Union, which has six reactors In seismic zones.

According to a news report in Janayugom, the organ of the Communist Party of India, the work at the reactor being built at Kransnodar, a seismic zone has been stalled In response to the peoples protest. Does this shelving, Inspite of the huge Investment made so far, indicates that the Soviet authorities are not all that sure, while Indian counterparts still quote the Soviet experience.

At Koodamkulam, the proposed site of WER 1000s, no environmental impact assessment and a study of the feasibility of rescue work in the event of a major accident has been done.

The atonic energy establishment in India will have to tell the people as to how the WER reactor, built at Atommash will be safe. The Soviet authorities should also reconuider the Justifiability of exporting a potentially dangerous technology to **a** nation which does not even bother to observe the preliminary safety measures ?

Chernobyl

Information regarding the accident was relayed to the neighbouring governments on the third day, only after Sweden sought an explanation for the radioactive anomaly observed by their monitoring agencies. Dr. Rosalie Bertell wonders as to how the US spy satellite (which has resolution power to read a license plate number on earth and locate lost persons In wilderness area) missed the explosion, graphite fire and evacuation of 25,000 people in the vicinity of the reactor. (9) More serious lapses have been reported In the official version regarding the dose to the people and the health effects.

Dose from Chernobyl

As per the data provided by the Soviet scientists to IAEA experts, the total dose to USSR people was 2 million man selverts (1 Seivert (sv) - 100 Rems). The IAEA sources point out that it is 20 million man Sv. (10) Roger H Clark of NRPB UK says that this difference is due to the underestimation of long lived isotopes like cesium 137 (Half life-Tl/2 33 yrs), strontium 90 (T 1/2 27.7 yrs) and plutonlum 239 (T 1/2 25.000 yrs) (11)

Valery N Soyfer, the geneticist who founded the first molecular biology and Genetics laboratory in USSR questions the correctness of dose assessment:

> Immediately after the accident, the Soviet mass media talked about the radioactive Isotope of Iodine 131. Its half life is relatively small, about 8 days. It **was** reported that 50 to 80% of all radiation that fell to the ground was made up of this isotope.
>
> In reality, iodine 131 formed no more than 10% to 15% in most of the tests. The longlived Isotopes often formed more than one-third of the total of radioactive substances. Yet the estimate of the future increase in cancer deaths was based on the presence of iodine 131 in the radioactive dust that fell on that part of the Soviet Union where 7E million people live. (12)

While Information on dose from cesium was denied to the Soviet people, their scientists told the IAEA experts that 1 million curies of cesium 137 has been deposited in the European region of USSR (13)

Caucer consequences

The Soviet scientists estimated 4150 additional cancers over the next 70 years, which is 'less than 0.05% from the level of death rates caused by spontaneous cancer'. Dr. Robert Gale, the American who did bone marrow transplantation of Chernobyl victims predicted 6000 additional cases. (14)

According to John B Goffman, the disaster would cause an additional 951,000 cancers (half of them fatal) and 19,500 leukemias. Of this, 424,300 would be in Russia and 526,700 in other countries. (15)

Alongwith this gross underestimation there was total denial of any probability of genetic/congenital anomalies or abortion. In an IAEA meeting at Kiev, the Soviet scientists advised the people to shed what they termed as radiophobia, which was spreading in USSR. (16) Says Zoyefer:

> The amazing peculiarity of the Soviet report is that there were no reference to future Increase in herldltary disorders. Specialists In genetics know that the frequency of herldltary diseases is greater than the frequency of cancerous degeneration under the influence of the same doses. This correlation applies to the consequences of Chernobyl as well. (17)

The governments in the West did tell their people all what they knew about the possible consequences of the fall out. While in the US data on increase in radioactivity was available for the public, France even refused to provide the same inspite of a request by the NATO allies. (20) Ail governments however consoled the people that the future health effects would be negligible.

Cheliyabinsk

The USSR set up its first plutonlum processing plant at Cheyabinsk in the Ural mountains in

1947. The military establishment had, In the next two years amassed enough plutonium to detonate a bomb in Sept. 1949, on the 70th birthday of Joseph Stalin.

In 1957 an accident took place at Cheliyabinsk due to the explosion of the ammonium nitrate in the waste. Some 10 million curies of strontium 90 and other highly active elements like plutonium spewed into the surrounding country side. About 60,000 **people had** to be evacuated, 30 towns eliminated. Eye witnesses testified of vast territory laid waste and the road blocks and warnings to travellers. There were huge piles of contaminated top soil, the contaminated houses were pulled down to prevent their owners from retrieving the poisoned possessions. Thousands of people were hospitalised, the local people referred to the Urals as "the graveyard of the earth." (19)

The first report of this accident, more serious than Chernobyl, appeared in New Scientist after 20 years.

Cheliyabinsk also housed a Secret Science Centre, where majority of the scientists were prisoners. Immediately after the accident, another research lab was set up here under Al Burnazlan, a Leutenant general and also a Deputy Minister of health. The dissident geneticist Zhores Medvedev says that he turned down, the invitation to work at the Radiation Research laboratory, since it entailed curtailment of professional freedom to publish papers and also a strict surveillance by the secret police. (20)

The results of 30 year long observation of plant, animal and human life In the Urals have not been published so far. Dr. Nikolai P. Dubinin, a geneticist mentions of a 1970 report of the President of Soviet Academj of Sciences in which results of 11 years of experiments and observation at the Urals were quoted. In the contaminated area.

> Some species died out, some continued to suffer for a long time their population reduced In size and some evolved towards a higher resistance. Ail the fine trees in the area died out and about 80% of the bush trees were severely damaged. Higher plants and trees were replaced by radioresistant grass. (21)

In the International Conference on Genetics heid in the USSR In 1977 Dr. Dubinin spoke to 2000 geneticists from all over the world that "any further advancing along the path of uncontrolled damage to the biological basis of mankind's existence could bring about great losses in the biological quality of human population. The percentage of children in Industrialised countries born with congenital anomalies more than doubled between 1956 and 1977. (22)

According to Rosalie Bertell, CIA has 16 secret reports on Cheliyabinsk, which they would not release. (23) The USA is the biggest producer of nuclear electricity and spent fuel waste containing Plutonium 239, an excellent bomb material and breeder fuel. Yet, they do not have a spent fuel reprocessing plant. Did the USAEC shelved their plans after seeing the horror at Cheliyabinsk ?

The Medical Data Which Needs to be Reanalysed and Published

Soviet Union and the Comecon nations have a third of the nuclear facilities in the world. Naturally, a third of the victims of radiation exposure also. Their proportion could be higher In Soviet people, since they have to keep and reprocess spent fuel from the plants exported by them.

The nuclear science establishment of USSR has been observing the ecological effects of Cheliyabinsk accident for the past three decades. Similarly, the health status of workers and population exposed to "lower" levels of radiation from the "normally" functioning reactors might also have been monitored. Findings of these studies are not available to the International community. The health statistics like birth anomalles, sex ratio at birth, cause of death etc. have to be reanalysed with specific reference to radiation and other carcinogens. A collaborative efforts by the international scientific collective with no bias against the Soviet Union or toward nuclear energy would definitely Increase our chances of survival. Soviet Union can well afford to spend a minimum of five years in sorting out the unresolved safety problems of nuclear power with the support and goodwill of global anti-nuclear, environmental groups. Construction or sale of nuclear reactors to other countries can also wait.

Kremlin has allowed the hawks from Pentagon to inspect the nuclee- Installtions in **Soviet Union. Now, a few doves doing medical** research must be allowed to see the voluminous health data of workers and people exposed to radiation from the civil and military nuclear programme.

From the statements of Dubinin and Soyfer, It seems that the damage inflicted on the national gene pool by the emissions and leaks from the nuclear fuel cycle Is likely to be massive and Irreversible. This invisible violence persisting even today in our soli, air and water might turn out to be more virulent, evasive and sustaining than the bulltets and barbed wires of the dark era. Glasnost demands that the killer be made visible.

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Can we afford Narora ?

As the countdown begins for the commissioning of the country's first post-Chernobyl reactor, the Narora Nuclear Power Plant, the campaign "Stop Narora" has barely a few weeks left to persuade the government to defer, if not altogether scuttle, a project on which It has already spent Rs. 532 crore.

In Narora, a Sanghursh Samiti Is mobilising people for a major protest. Early in September, 14 ruling party MPs from Uttar Pradesh submitted a memorandum to the prime minister to stay the commissioning of the Narora Reactor. Rajiv Gandhi Is expected to be receptive to a proposal for a dialogue on Narora with eminent citizens, as an image-building exercise.

Despite Chernobyl, for Rajiv Gandhi and the Indian atomic energy establishment, the promise of the nuclear dream remains Intact. If India is to meet the ever-growing demand for an assured source of power supply, atomic energy is alone the answer, Is the establishment view. Considerations of safety are brushed aside as the hobgoblin of technologically ignorant minds. "More people die from accidents than radiation hazards. The adverse impact of nuclear power on human life is far less than that of cigarette smoking. Nuclear power is as safe as any other source of power supply." These statements have been made by successive chairman of the Atomic Energy Commission.

What about the near disaster at the American Three Mile Island station in 1979 ? Former Commission chairman Raja Ramanna saw it as a demonstration of how well the "fall safe" principle of nuclear power reactors works. And Chernobyl ? WorldWatch Institute "State Of the World 1987" report points out, "Potentially health threatening levels of radioactive material was deposited more than 2000 kms from the plant in at least 20 countries." But here, undeterred by the Chernobyl cloud, faith in nuclear energy is nurtured by Doordarshan ad capsule on the goodness of energy derived from the atom.

If safety considerations evoke so little concern, what about the economics of nuclear energy ? In the 60s, the architect of India's nuclear establishment, Horn! Bhabha, used to speak of nuclear energy as being too cheap to meter. But today staggering cost overruns continue to plague nuclear power projects. In the case of the Narora Reactor estimated to cost Rs. 200 crore, cost overruns are likely to be more than Rs. 323 crore. This does not, of course, include costs for waste management. The chairman of the AEC, Mr. Srinivasan may glibly claim that the technical problems associated with the production of heavy water have been solved, but the facts are chastening. Till 1986, India produced not more than 24 tonnes of heavy water against an installed capacity of 301 tonnes and a requirement of 558 tonnes. About 131 tonnes of heavy water were Imported from the Soviet Union at a cost of Rs. 30.80 crore from 1980-82.

Financial problems, technical difficulties and safety concerns have elsewhere In the world resulted In a drastic reduction of the nuclear energy profile. But in India till recently critics of the country's nuclear policy were denounced as CIA agents. The department of Atomic Energy functioned virtually as a secretive sub government beyond accountability to Parliament.

The Comptroller & Auditor General's reports on MAPP and the heavy water plant in Tuticorin have came as a shock and changed the sacred cow status of atomic energy. It is now quite common for AEC chairman Srlnivasan to talk to the press or with anti-nuclear activists. Even the bete noir of the atomic energy establishment Dr. Dhirendra Sharma has been invited to address officials at the Bhabha Atomic Research Centre ! Only last month a press party was taken to the Narora plant where they were reassured by managing director about the special safety provisions of the plant. Interestingly, the party did not appear to include any of the correspondents who normally cover the subject.

Empty exercises in PR ? Perhaps. They are nonetheless Indicative of the pressure the anti-nuclear lobby In the country has successfully built up.

Narora has been the most controversial of the planned atomic power stations because of its situation : on the banks of the Ganga only 56 miles from the Marodabad belt of the 1956 earthquake. Going contrary to the conventional wisdom of never setting up such plants on alluvial grounds and fractured rocks, Narora was chosen for political considerations. This was despite the strong criticism of the site by the 1972 interim report of the Vegurlekar Site selection Committee for future power plants.

NAPP managing director now assures us that adequate care has been taken to ensure the stability of the plant in high seismic zone, never mind that the cost of redesigning the foundation structure at Narora has consequently qudrupled. But even if we were to accept that the country has been able to acquire the expertise to construct an earthquake proof building, what about the claim of Dhirendra Sharma. that several engineers involved with the project have expressed concern about the use of substandard material ?

On September 22, 1982 there was major breakdown in RAPP-11 due to a "manufacturing defect" in the "moderator heat exchanger (ME)", according to a report In *Sunday* magazine. Subsequently, Dhirendra Sharma was able to confirm from engineers or. the site that their counterparts who had pointed out the defect at the time of delivery of the MHE from Larsen & Tuobro had been overruled by DAE and transferred, Sharma in his book *India's Nuclear Estate* claims that L & T officially admitted that they received a concession from DAF. on the original quotations as they were unable to meet the standards stipulated.

The CAG report on MAPP also emphasises the existence of faulty material and equipment supplied by the contractor. For storage of helium and heavy water, 62 stainless steel tanks were erected between 1975 and 1979 after due clearance by the Quality Surveillance Wing of the DAE. However 22 were found defective and had to be replaced with carbon steel tanks. DAE explained that the 22 tanks had developed leaks because they were not used immediately, as MAPP was delayed by more than eight years.

Sharma is also sceptical about the confidence displayed In the "failsafe" systems all of which are electronically controlled and require a constant source of outside power.

Narora, he claims, suffers from the two very flaws singled out by Soviet physicist Valery Legasov : accident-prone construction and lack of reliable emergency systems. Even routine spillages of radioactivity into the Ganga will contaminate the remaining 1000 kms to the Bay of Bengal.

These fears may well be exaggerated, but we have a right to know about the risks Involved. Nuclear power requires an extraordinary faith by the ordinary citizen in the technical elite - a faith that has been badly shattered.

Demonstrations

About 60 young girls from Delhi squatted on October 6th, 1988 outside the gates of Narora shouting slogans like Parmanu Bijli bandh karo (stop nuclear power). The girls, from Delhi's prestigious Lady Shrl Ram College and Jawaharlal Nehru University, sat all morning effecting a partial rasta roko.

The students had come a distance of 125 km to this tiny town on the banks of the Ganga to |oin the first anti-nuclear demonstration at the site. The Students Action for Environment and the Women's Development Cell of the College had enthusiastically responded to the call from the Committee for a Save Nuclear Policy (CONSUP). Amidst gaily-coloured banners saying "Rs. 800 crore, that is cheap nuclear power", they sat in the blazing sun listening to Dhirendra Sharma's impassioned warning that while the Bhopal disaster had affected thousands, a mishap here would be much worse. "For 10 to 30 years of electric power you are endangering generations to come", he said.

Initially, a Delhi-Narora march had been planned, but few turned up on October 2 for the march and it was decided Instead that volunteers would travel to the villages neighbouring Narora and warn the people of the dangers of an accident in the Narora plant, which is located in an earthquake zone.

The volunteers had very mixed experience. At Ghaziabad when they put on a slide show in a temple, the audience which was expecting a feature film, turned hostile and flung mud at the screen, said a volunteer from the Network to Oust Nuclear Energy (NONE).

But at Dlbal, a few km from Narora, despite opposition from the local Congress-1 MLA, they were not only able to win the support of about 40 students at the Digambar degree college, but the principal even gave them money to get to Narora to join the demonstration Kuldeep Kumar, a young motorcycle mechanic, also came with them. For 12 years he had indifferently watched the shadow of the Narora plant steadily lengthen across the Ganga. It was only this week that he learnt what radioactivity could mean for them and the thousands of others in the neighbouring village.

He had read about Chernobyl accident but failed to make any connection between the gleaming with domes of the power plant coming up here and the explosion of the Chernobyl reactor. His friends at the college had no idea what radioactivity was. May be the science students knew, but certainly not the others.

Did the people feel that the nuclear power plant would be advantageous to them ? Would it bring employment, development of industries and electricity ? this correspondent asked. "What benefit, they are even taking our farm land away from us", Kuldeep said, referring presumably to the 15 km radius that the government Is obliged to maintain as a safety zone as per International Atomic Energy Association regulations. For most of the villagers, the danger of radioactivity is a cold abstraction, and the question of more adequate compensation for land taken over is far more emotive issue.

What about the 470 MW of power that the two nuclear power plants would generate ? That power is not for the locals. Kuldeep said, Engineers from the plant who frequented his shop had told him that the electricity was for industrial units in Kanpur.

Meanwhile, Dhirendra Sharma was elaborating on the differences between rural and metropolitan India. High technology as represented by the nuclear plants was for the cities, while those in the villages and small towns who bore the most risk benefited the least, Sharma stressed. "Reach out your voice to the hellcopters of Raj Bhavan, wherever he is", exhorted Sharma, referring to the prime minister.

But even were the voices of the demonstrators to reach the prime minister, It is too late for dialogue. The Narora Atomic Power Plant (NAPPS) Is scheduled to become critical' by the end of the year. According to project director Krishna Chopra, the process of commissioning the reactor Is well advanced. An application for heavy water has been made. The plant needs 235 tonnes of heavy water per reactor initially as coolant and moderator. Some 9-15 tonnes are required per annum as replacement for process losses in this natural uranium reactor.

However, In view of the disturbing reports about the indigenous heavy water production, the commissioning may well be delayed. The Madras atomic power plant suffered a 16 month delay in commissioning because of the non-availability of heavy water. Atomic Energy Chairman M. R. Srinivasan however maintains that the problems with the heavy water projects have been ironed out.

Project director Chopra easily brushed aside fears about the safety risks involved, "SAfety Is looked after in an absolute updated post-Chernobyl."

Sources: Rita Manchanda in The Indian Post, Sept. 23rd, 1988 and October 8th. 1988.

Editor's Note : The commissioning of the Narora reactor which was first stated for October '88 and then December '88 has now been postponed to March '89 May be al! ts not as well as the nuclear authorities would have us believe

NEW DIMENSIONS TO SELF-RELIANCE

A high-level cabinet working group was set up in December by West German Chancellor Helmut Kohl to Investigate accusations by West German federal prosecutors in Hanau that top officials from two firms had exported a variety of nuclear components and materials from West Germany to Pakistan, India and South Africa. The exports, which took place between 1982 and 1988, were in violation of West Germany's Foreign Trade Act. Key suspects in the case Include a past technical director of NTG-Neue Technologlen Gmbh (NTG), and the present director of the nuclear consulting firm Physikallsch Technlsche Beratung (PTB). Prosecutors say a third firm, Gutekunst, may have also been Involved by procuring tritium gas and nuclear technology for PTB and NTG, possibly in another country. The illegal exports reportedly Include both unspecified quantities of the tritium gas as well as tritium processing equipment. Tritium can be used as a neutron generator for a fission bomb.

In addition to transactions that are blatantly Illegal, exporters In Germany have taken advantage of loopholes In West German laws on nuclear materials (among the most lenient In Europe) to trade in what is being called a "gray market" In nuclear materials.

Alfred Hempel, a nuclear broker and former Nazi officer, whose West German company Rohstoff Einfuhr GmbH Is also being investigated, is said to be a pioneer In this flourishing "gray market". An article appearing in early January in The Wall Street journal describes some of Hempel's shadowy deals involving the sale of heavy water. The Journal also notes that Western sources estimate there are now 25,000 tons of heavy water in the world. About half of It Is In Canada, whose CANDU nuclear power plants require it to operate. However, Canada, says the article, imposes heavy controls on its heavy water business. Much of the world's other heavy water Is believed to be in plutonium production reactors operated by the "nuclear powers" to make atomic and hydrogen warheads. What portion of the remainder has spilled over into the "gray market" is unknown.

in one deal described by the journal, a chartered West African Airlines Boeing 707 left Basel, Switzerland on December 1, 1983, carrying 122 barrels of heavy water. Heavy water is supposed to be one of the world's most closely guarded materials because it is used in production of high-quality plutonium for nuclear weapons. But apparently nobody was on guard that particular afternoon. According to the paperwork accompanying the shipment, the flight was from Oslo carrying 15 metric tons of heavy water to Frankfurt, West Germany. In actual fact, the flight had gone from Oslo to Basel, where the cargo was sold by Hemple's Rohstoff Einfuhr company to a Swiss company, Orda AG. Then 6.6 tons of Soviet heavy water were added to the Jet's cargo. After it was loaded, the Jet took off for Its ultimate destination: Bombay. Hempel, who as it happened, also controls the Swiss Company involved, made at least US$15 million on that deal.

According to Dieter von Wuerzen of the West German ministry of economics, even though these shipments were Initiated with a West German government Import certificate authorizing a shipment to Frankfurt, they were not covered by West German law - because, says the ministry, the flight never entered West German territory.

Hempel similarly manipulated IAEA regulations two years later In another sale to India. Under IAEA regulations there is a loophole that waives controls over heavy water shipments of less than a ton, so, In 1985, according to Swiss records eight shipments totalling 6.8 tons of heavy water from the Soviet Union arrived at the Zurich airport. All the shipments were, according to paper-work, destined for different customers all In Western Europe. However, at the airport the papers were changed, making It all one package. It was then rerouted to India. When Moscow was informed of the true destination of their sale, they checked the papers from the Soviet trade agency that dealt with Hempel. "They were In perfect order," said Moscow's man in charge. Some of the papers even had notations that the heavy water had actually been received by customers In Western Europe...

Criminal investigators in Norway and US officials are also Investigating Hempel, studying evidence that he has supplied nuclear materials to India, Israel, Pakistan, South Africa and Argentina, all of which are assumed to be (and some of which are known to be - why Is It the press still Ignores such obvious evidence, especially in the case of Israel?) involved In making nuclear weapons. What they are finding Is that Hempel uses a network of more than a dozen German, Swiss and South African companies to, as one US official put It, "dance on the edges" of international controls meant to limit nuclear proliferation. Hempel has also, beginning In the early 1980s, involved China In his many deals. China hasn't signed the Nuclear Non-Proliferation Treaty - not that it seems to matter whether a country has signed or hasn't, but a big deal is being made in this case of the fact that China hasn't. Anyway, to try to make a long story short, acording to The Wall Street Journal, US officials, who asked not to be named, say the Chinese deals were huge They apparently involved more than a hundred metric tons of heavy water to India alone. At the same time, US officials say, Hempel's companies sold "substantial quantities" of Chinese heavy water and enriched uranium nuclear fuel to the military junta ruling Argentina.

The Chlna-Hempel connection came at a time when the *US,* France and other Western suppliers were boycotting South Africa, trying to force it to open up all of its secret nuclear facilities to International International inspection In exchange for nuclear fuel. South Africa has never agreed to do that. It hasn't had to. With a little help from Hempel, at least 60 tons of Chinese enriched uranium found its way there when South Africa needed it to start two nuclear power reactors.

Some of the questions Investigators are asking about this man's deals are rather Interesting. Information that has come out so far makes clear that successive Bonn Governments have protected West Germany companies exporting nuclear materials and technology to Pakistan, India, Argentina and South Africa. So questions like, how have West German government officials secretly helped Hempel sell nuclear materials are to be expected. But they are also asking questions like, how has a man, who several years ago flaunted his Nazi past by sending Christmas cards showing himself in his medal-covered Wehrmacht uniform, been able to deal so easily with officials in Israel, Norway and the Soviet Union.

Meanwhile... the federal prosecutors in Hanau are continuing with their investigation of the original scandal that led to the current allegations. That's the scandal involving Transnuklear, a company that transported and processed lowlevel waste from nuclear reactors until the West German government took away Its license. Well, It sems that over the last decade or so executives of this company had, among other things, been spending millions of Deutschmarks In unexplained payments and outright bribes. And when that came out, early last year, rumors about West German companies shipping plutonlum to Pakistan and Libya also surfaced (Anumukti voll. no. 4, Feb '88). Those rumours have not been substantiated...not yet. anyway.

Source *WISE NEWS COMMUNIQUE 3060(306.3053)*

'KAIGA CHALO' AGITATION BEGINS

There was a big meet at Karwar in Karnataka on 2nd October, 1988 Gandhi Jayanti Day to protest against the Installation of nuclear energy plant at Kalga. About 2500 activities from different parts of the state participated in the meet. Of these, about 500 were women. The majority of the demonstrators belonged to North Kanara district. The rest were from Shimoga, Mysore, South Kanara, Dharwad and Bangalore.

A procession was taken around the town with placards and banners. The processionists sang songs and shouted slogans. Despite poor weather the enthusiasm of the protesters was unbounded. They urged the government to scrap the project and save the people from radiation disaster and proliferation of radioactivity After the procession, a public meeting was held in the evening. Speakers requested the protesters to bring to a halt all work on the Kainga plant within six months and to ensure that funds from Kaiga were diverted to ecologically sound projects which would guarantee equity and employment for the residents of North Kanara. The meeting was held under the presidentship of Dr. N. Shanta Bhatt. Among the prominent speakers were freedom fighter H. S. Doreswamy, Journalist Nagesh Hegde. National Award winning film director Suresh Heblikar, Food scientist Dr. A. N. Nagraj and former MP B. P. Kadam all of whom reiterated their support for this popular people's movement.

The next day there was march led by Sri Vlsveswara Theetharu the senior swami of the Udipl Pejawar Mutt to the Kalga plant office. The marchers demanded the Immediate closing down of the office and stoppage of all work at the Kalga plant. 375 people braVed the hot sun and stood by the swamljl when he requested Dr. P. T. Tiwari, the director to the office to close down the office permanently. But he expressed his Inability to do so though he did close the office for the day. All the protesters were arrested when they tried to forcibly enter the office.

Before the satyagrahis dispersed, It was announced that a two district action committee would be formed at a meeting of taluka representatives. It was also decided that number of senior activists would tour the districts to mobilize the people for the next phase of the struggle.

The success of the Kaiga Chalo march was due to the untiring efforts of many activists from all over the North Kanara district and Karwar town. Special mention must be made of Dr. Kusuma Sorab and her volunteers of Sneha kunja. Shri An ant Hegde of the Seva Sagar trust and the volunteers of Parisar Samrakshana Vedike, Sirsi.

Based on a report by Kaiga Roko Action Front and an article by Shri H S Doreswamy in Vigil of 15/11/88

Debate On Nuclear Power

To the credit of the Karnataka government, it has honoured the word of the erstwhile chief minister, Mr Ramakrishna Hegde, who had promised to hold a national debate on nuclear power, following the controversy over the Kalga atomic power plant in Uttara Kannda district. This Is the first time that the votaries of nuclear power - led by Dr. M. R. Srinivasan, Chairman of the Atomic Energy Commission (AEC) - have met face-to-face with the "opposition".

Indeed, those who have been objecting to the use of nuclear power in India in general and to a location in the sensitive ecosystem of Karnataka's western ghats in particular can hardly be blamed for believing that the nuclear establishment has not only chosen to turn a deaf ear to criticism but also refused to part with Information on this vital issue. Only too often, the AEC more readily releases documents to the International Atomic Energy Authority than to critics at home.

Since both sides are too deeply entrenched in their own well-known positions on this contentious issue, it was too much to expect any consensus to emerge from the Bangalore meet. At best, as this writer observed, there should have been a dialogue, Instead of a duologue, so that the two could have heard out each other calmly. Acrimony, of which there was unfortunately too much, could have been avoided.

Nevertheless, the very fact that the debate was held was an important departure. The estab lishment has agreed to appoint a retired scientist who will liaise between the two sides and provide Information. What is more, there will be repositories of official documents relating to nuclear power in major cities. Perhaps the imminent entry of Soviet nuclear know-how also heralds a new spirit of glasnost in the atomic energy 'state" here.

Cardinal Factor

Inevitably, the Bangalore discussions revolved round the cardinal factor, safety. As Dr Srinivasan remarked, "We must take risks because societies that have, have progressed. Nothing ventured, nothing gained." This was countered by the anti-nuclear lobby which pointed out that India's safety record at Tarapur and other plants was dubious. Medical experts drew attention to the incidence of mongolism among newborns In certain coastal areas of Kerala, where sands are radioactive, as well as to complications caused to workers at the Kalpakkam power plant.

While these "costs" of harnessing nuclear power can be argued ad nauseam, with both sides providing conflicting data, perhaps the more illuminating point of contention is the necessity of producing such power In the first place. Only too often, protagonists of nuclear and other forms of centralised systems of providing electricity equate "power" with "energy", as though the two were the same. As a matter of fact, even the catch-all "energy" they refer to is actually only commercial energy, while the bulk consumed in this country - particularly by the poor, both in villages and towns - Is fuel for cooking, and almost all of it in rural areas in non-commercial or collected "free" (with the labour of women and children).

As Dr Amulya Reddy, the wellknown alternative energy expert from the Indian institute of Science (HS), where the debate was held, argued, "Energy Is treated as an end in itself and the focus is on Increasing energy consumption." His case is amply illustrated by the experience of Karnataka. When environmentalists halted work on the Bedthi hydel project in the same district as Kalga earlier this decade, they calculated that the per capita rural expenditure on all forms of energy in the state had declined (at constant prices) from Rs.1.66 per month in 1951 to Rs.1.23 in 1976, even though the generation of electricity had increased ten-fold in the same period.

Crying Need

The pro-nuclear lobby asserted, persuasively, that this form is not only cheaper than hydroelectric of thermal power - not to mention renewables like solar and blogas - but also that it has no adverse environmental effects. Unlike hydel, It does not flood vast tracts of forest; unlike thermal, It does not pollute the atmosphere. Mr S.K Kattl, who heads the Nuclear Power Corporation, stated: 'There Is a crying need for power from any source".

However, the old claim that nuclear power would become "too cheap to meter" appears far-fetched today. Despite what Dr Srinivasan maintained about more countries going nuclear, the industry has suffered a setback, especially after the Chernobyl accident. What is more, even on its more attractive advantage - its low cost per unit of power - it can be faulted. Dr Reddy has shown that if three elements are included in costs: the AECs actual performance in completing power plants (15 years instead of eight), proper waste disposal practices and the comptroller and auditor general's estimates for heavy water, the cost per kilowatt-hour can rise to 122 paise from the AECs 99 palse, while thermal power costs only 101 palse.

Because the nuclear industry, worldwide, faces an ever-increasing cost escalation as public awareness about its hazards continues to grow (particularly after Chernobyl), attention must be drawn - when planning a new station like Kalga - to alternatives. The first is to save a kilowatt, instead of producing one more. In Karnataka, as throughout the country, as much as 22 per cent of the electricity produced through centralised power systems is lost on transmission and distribution. if various conservation measures are taken at the point of consumption, every kilowatt thus saved is equal to 2.03 KW generated, as pointed out by an expert group's perspective plan for Karnataka.

Some of these conservation measures include modernising the state's power-intensive industries (like the private sector aluminium plant in Belgaum), making irrigation pump sets energy-efficient , replacing conventional bulbs with fluorescent ones and electric domestic water heaters with solar appliances, and using LPG instead of electricity for cooking. The plan showed that with these five measures alone, Karnataka's power deficit for 1986-87 would become a surplus of 458 MW the equivalent of two Kaiga-type 235 MW reactors.

The need to conserve pOnver, before producing more of It from centralised systems, should be apparent from the fact that big Industrial units account for no less than 70 per cent of the electricity consumed In Karnataka. Whatever the other benefits of these Industries, their employment potential Is extremely small, which prompts a re-examination of the social benefits of concentrating such a large chunk of financial and physical resources in this one all-important sector. Nationally, power received nothing less than a fifth of the total investment In the Seventh plan.

If one reverts to the earlier observation that It Is the total energy that Karnataka should be worried about, and not Just the generation of power. It Is clear that renewable forms ought to be given much more emphasis. (The country-wide picture is no different, with these receiving 0.3 per cent of the Investment in the last plan.) With some 13 million cattle, the state is as well equipped as almost any other to meet the energy needs of Its population from gobar gas.

According to Prof K.S. Jagdish of the IIS, with a low output of 4 kg of dung per head of cattle a day, It should be possible to produce sufficient blogas, with which an electricity capacity if generated for eight hours every day of 250 MW can be created. In other words, each village can reap the benefits of a 10 KW power station. He also advocated the conversion of wastelands Into firewood and foddar plantations, as well as the replacement of bullock power with biogas.

Energy Scenario

For such a transformation of the energy scenario to take place, of course, the essential prerequisite is the proper management of the "commons". The task could be undertaken, rather like the mandate given to the National Wastelands Development Board by Mr Rajiv Gandhi, over a five-year period. As Prof Jagdish argued, "This approach solves at one stroke the problem of soil erosion, high rainfall run-off due to deforestation and the shortage of rural energy". Such a holistic and reinforcing solution would also attend to the dilemma of mass unemployment, unlike the path carved out by centralised energy provision.

The location of the Kaiga atomic power plant does precisely the opposite. Quite apart from the safety hazards and ever-escalating costs, the very site on the western ghats, from which several rivers flow, militates against that new "buzzword": sustainable development. Very simply put. It amounts to a choice between generating power from two 235 MW atomic plants at Kaiga (four more have recently been sanctioned there) or meeting the energy and employment needs of the entire state, with all the spinoffs of environmental enhancement.

Courtsey DARRYL D MONTE Times of India 23 12 88

LETTER BOX

By reading the articles, of the August issue I felt very upset. I thought that Anumukti would guide the antl nuclear movement In India. For this, It is necessary to collect and publish Information on anti-nuclear movement as well as expose the activities of our Atomic establishment. On 6th August, there were processions in Kakrapar, Bombay & Calcutta against Nuclear Power. Comments of V. Legasov published in Moscow News (July 17, 1988) could be reproduced In Anumukti.

We are trying to organise movement against the proposed Nuclear plants in West Bengal. But Anumukti won't provide any guide for our would be activists.

Niranjan Haldar
79, R. K. Ghoshal Rd.,
Calcutta-700 042.

Editor's reply :

What males nuclear industry so Irresistibly attractive to leaders' of third world elites is the possibility of producing a nuclear arsenal from Its waste products. The August Issue was devoted bringing out this connection In detail. Regrettably the publication of the August issue was delayed. I had given the complete 'matter' to the printers on 3rd of August hoping to post the Issue by the 15th. Unfortunately due to a death at the printers and the resulting disorganization I received the printed copy only on the 26th of September. Consequently there was no possibility of including reports of protest demonstrations which took place on 6th and 9th of August. The present Issue does contain reports about protests in different parts of the country. I still cannot Include a report of the Calcutta demonstration since I have no information about it and your letters was the first 1 heard about it.

Anumukti cannot fulfill its function of being a link between groups of activist in different parts of the country unless activists themselves feel the need and send reports regarding their activities to it-

Received your Journal Anumukti of August 1988. This type of Journal working for non-nuclear India is essential at this stage because now our country has got a number of nuclear plants In different states and Intends to open more. Anumukti must create awareness in the people. Articles, especially like 'Daughter of the A - Bomb' must be published, which highlight the III effects of Nuclear Bombs. Congratulations.

ASIAN YOUTH CENTRE
H. Q. 37, Melpadi Muthu Street,
Nungambakkam, Madras - 600 034.

Mr. M. R. Srinivasan, Chairman of the Atomic Energy Commission recently announced a programme for 12 new nuclear power reactors with a total capacity of 6000 MW to be set up as a part of the 10000 MW nuclear power programme by the year 2000. In view of the secrecy surrounding the AEC working, It would be too much expect more Information than whatever has been announced till the plants are set up.

This programme will not come up for public debate. There may not be any avenue for submitting objections like the enquires that Department of Environment organises for other projects. Should we take the AEC 6000 MW programme low lying or shouldn't we put up a concerted stand on a national basis ? The-AEC announcement should not go unchallenged or unopposed.

KISAN MEHTA
Save Bombay Committee
C/o. KAYJAY ENGINEERS
123, Mahatma Gandhi Road,
Bombay - 400 023.

The August Issue of ANUMUKTI contained some Interesting and moving articles. Sri Lanka is a country without nuclear energy plants and without atom bombs. Nevertheless, the problem Is one of concern for the whole of humanity. We recognised this fact when It was made the topic of the daily meeting in our pirivena (monastic school) on Hiroshima Day and also in the meeting of the Mahila Samiti based at the temple, the next day.

It has to be mentioned that the rural population here doesn't have a perspective which reaches much beyond the southern areas of Sri Lanka. On that day, however, for the first time the ladles of the surrounding villages started to think for the whole humanity. They understood that the nuclear question Is also their problem and decided to build up a strong women's organisation to conduct a public programme with a silent procession of mothers and children, prayers and meditation on next Hiroshima Day. Issues like this one and other environmental problems which threaten human life on the whole earth, we hope, can be made a permanent part of the traditional programmes in our temple.

Dr. Ven O. Sobhita
Sri Bodhiraja Bhikku Training Centre,
Embilipitiya, SRI LANKA.

I brought a confidential report from Sweden, IAEA' Board of governor's Safeguards implementation Report for 1986, date 4 May, 1987. It is a 68 page document. If any one is interested in getting a copy against payment, he may write to me. SIPRI-1988 report describes Nuclear weapons situation in China, India and Pakistan. Copies are available with

Mr. R Dasgupta,
49/4. Hindustan Park,
Calcutta-700 029.

N. Haldar
79, R. K. Ghosai Rd.,
Calcutta - 700 042.

Going through your number of August 1988, found some spelling mistakes. "Hypocrisy: spelled as "hypocracy". The latter spelling Is wrong. Similarly "Occurences" Is spelt as "Occurances". I did not read the magazine thoroughly, I Just went through the sub-titles and found these two glaring mistakes.

D. N. Mittal;
Guru Nanak Pura,
BASSI -140412.

Editor's reply : I am solely to blame for these errors. My spellings have remained a constant source of exasperation to all. Since I am also Anumukti's only proof reader, a solution is not easy to find. Deeply regret, and promise to Improve in the future.

THE BANGALORE WORKSHOP

The National Workshop on Nuclear Power Projects with Specific Reference to Kaiga, organised by the government of Karnataka was held in Bangalore on December 10th and 11th, 1988. It was a unique event which brought together both antlnuclear activists and the nuclear establishment to share the same platform and almost equal time.

The scene of the confronation was the auditorium of the Indian Institute of Science. The debate at times grew rather acrimonlus. Elsewhere in this Issue we have published other accounts of the proceedings.

First it is important to understand what the workshop was not. It was not an exercise in creating an informed public opinion - an attempt at educating the public about the pros and cons of nuclear power. Therefore, It was a close-door, by Invitation only affair. A gathering of the experts' and a gathering for the experts. Neither was the workshop an expression of the open mindedness of the Karnataka government regarding the nuclear alternative. Despite assurances by ministers during the opening session it was clear from the very beginning that the decision on siting the nuclear power plant at Kalga did not depend on the outcome of the deliberations at Bangalore.

However, in a limited context, the workshop was a very useful meeting. The nuclear establisment was represented in full measure. All the big shots were present along with most of the second line. Glasnost' was a much abused word. The workshop did serve many useful functions however, and can be thought of as a milestone on the road to a non-nuclear India.

Firstly it showed unambiguously to everyone, (including some sceptical activists themselves) that the antlnuclear movement has gained a certain maturity. The arguments are no longer exclusively emotional - based entirely on a sense of moral outrage. The moral passion still underlies the foundation but it is reinforced by a technical understanding . The bland reassurances of the nuclear establishment - "leave the nitty-gritty to us" - no longer suffice.

A very large number among the scientific community share a feeling of vague unease regarding the nuclear enterprise. Normally these feelings remain amorphous. The forceful articulation of antinuclear views at the workshop helped many 'neutrals' to make up their minds. This side-effect of the workshop would greatly help the movement in the future.

Thirdly, the workshop was a place where one could learn new things. Two facts gleaned there deserve special mention.

1. Indian nuclear programme is based on reprocessing of spent fuel. Contrary to the practice in other countries the earlier policy of the Department of Atomic Energy was to locate reprocessing plants at reactor sites. This raised (by a large amount) the radiological burden at the site but it did avoid the dangers involved in transporting of highly radioactive spent fuel, (see Anumukti vol 1. No.3, Dec.'88) However now, unannounced, there has been subtle shift of policy. Thus, though there Is a reprocessing plant at Tarapur and another is under construction at Kalpakkam, the department Is ambiguous about whether there would be plants at Kalga and at other reactors sites. Meanwhile without as much as a by-your-leave of the residents enroute. It has started transporting spent fuel in trucks over thousands of kilometers. Spent fuel is extremely hazardous, and an accident Involving It could be a major calamity. The right of informed consent is a cornerstone of any system based on natural Justice and ought to be respected by all - even by sacred cows like the D.A.E.

2. The breathtaking announcement by the chairman of the Atomic Energy Regulatory Board (AERB) who said that site selection was political decision and the AERB was in no way connected with it. This, while the atomic energy establishments all over the world spare no effort at assuring the public about the great care that goes Into all aspects of safety of nuclear plants starting from site selection, (see the note following this article)

The most useful outcome of the workshop was the reluctant admission by the establishment of its duty to provide factual Information to the public. Specific reports like the Sriram report on Tarapur and the Ramarao report on Rawatbhata would be made available in some public libraries.

Dr. Ramanlah, the president of the Indian Nuclear Society was designated by the chairman Dr. M.R. Srinivasan to co-ordinate this. Any activist desirous of any specific report or Information should directly contact him. His address is:

Dr.M.V. Ramaniah
Indian Nuclear Society
Engineering Hall No. 7
BARC TROMBAY
BOMBAY 400 085

SURENDRA GADEKAR.

NO COMMENTS!

The Search for an Ideal Location

Where a nuclear power plant is located can affect its safety and ultimately the public health and ecological balance In the surrounding area. Before a site is selected, many factors are carefully assessed to determine, as far as possible, whether the Interaction of a plant and Its site would be harmonious or would pose unacceptable risks to safety. How susceptible Is the area to earthquakes and other extreme environmental phenomena ? Although plant design can counter many potential safety hazards, others many present difficulties so formidable that they are best avoided altogether through the selection of an alternative site.

A proposed site is also viewed from the perspective of how population density, patterns of water and land use and other features would influence any radiological effects of the plant under normal operating and accident conditions. As a corollary, the feasibility of emergency plans are studied, such as the availability of transport and communication network.

Source : Basic Safety Principles for Nuclear Power Plants : Highlights of a Report of the International Nuclear Safety Advisory Group (IAEA Topics June'88)

The selection of the site of a nuclear power plant is a political decision. The Atomic Energy Regulatory Board is net involved in the site selection process.

Source : Dr. A.K. De, Chairman, Atomic Energy Regulatory Board at Bangalore, December 11th, 1988.

ANUMUKTI

A JOURNAL DEVOTED TO NON NUCLEAR INDIA

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Subscription Rate:
Rs. 25/- per year (Indian Subcontinent)
US $ 15/- per year (airmail abroad)
US $ 7.50 per year (seamail)
Please add Rs. 6/- for out station cheques.

Editor: Surendra Gadekar

Subscriptions, Donations, Manuscript, enquires regarding Circulation etc. should be addressed to

Editor Anumukti
Sampoorna kranti Vidyalaya,
Veddhhi, Via - Valod
District :Surat-394641

Published by Surendra Gadekar for Sapoorna kranti Vidyalaya and printed, him at Progressive Printing Press, Surat. Typesetting by: Easy Typesetters, Sura*.

Printed Matter Book Post:

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Volume 2 Number 4 February 1989

"No power is as expensive as no power."
Dr.Homi J Bhabha

The father of the Indian atomic endeavour was a dreamer. He dreamt grand dreams: of catching up with the West; of breaking the vicious circle of poverty; of unlimited growth. His answer to no power was "nu power". Nuclear energy was to be The Answer. Its task was to take India to its rightful place in the new world of plenty for everyone.

Four decades on, the answer does not seem like an answer anymore. There are just too many questions attached to it. What then, are the answers? Is there an alternative to nuclear power? What is the 'ay out? Will poverty ever vanish from this land?

The energy establishment today, like the political leadership, is not made up of dreamers- but rather by schemers. Their thinking is immobilised by self constructed mental blocks. Like the Bourbons of France they have "learnt nothing and. forgotten nothing". The nation strives on, borrowing more and more from abroad, lurching from one crisis to another, beset by endemic power shortages, hoping against hope that the latest 'temple' of modern India would somehow ease the situation.

The real energy crisis - women walking yet more miles for firewood; nutrient rich biomass ending up as smoke and adding to the greenhouse effect; the resultant deterioration in soil fertility requiring ever larger quantities of chemical fertilizers .... is not of concern to the power obsessed.

"How much land does a man require?" is the title of a short story [by Tolstoy. It beautifully illustrates our present condition. Like the protagonist in the story we are running wildly, trying to gather more and more while the target seems 'farther than ever. If we are not to kill ourselves like him, we need to pause and think.

Do we need energy per se or do we need energy for accomplishing certain tasks? Can we do these tasks using less energy? Is electricity synonymous with energy? Who needs and gets electricity? How much is enough? What is the relation between the deepening ecological crisis the loss of traditional sources of energy to the common people, the increasing role of the commercial' sector and the grandiose dreams of power? How long will the present system, based on conspicuous consumption by a few and enormous waste by all, last?

Today Bhabha's dictum stands on its head. No power is cheaper than no power (unwasted power). Others use ten times less power than we do to produce the same quantity of goods. By far the overwhelming portion of new energy all over the world during the last fifteen years has come from increased efficiency and less wastage.

India is not a poor country. There is enough for everyone's need. What we need is to get rid of the greed and the greedy. That is the way to Swarajya.

Surendra Gadekar

"Energy and Environment" is the title of a course offered by the Sampoorna Kranti Vidyalaya in Vedchhi, Gujarat. The duration of this course would be approximately three months beginning according to the convenience of the participants as well as the Vidyalaya. The course is open to young men and women interested in the subject who are able to read English and are able to study independently under the guidance of an instructor. Other courses at the Vidyalaya - a non-violent training centre in the tradition of Gandhi, Vinoba and JP - are "Ahimsa and World Peace" and "Revolution in Theory and Practise". For more information, please contact Editor Anumukti.

Bursa's Forests in Danger

The Asian mainland's largest .tropical forest area is now in grave danger of being denuded as demand for Burmese wood increases, making the export of tropical wood a very lucrative business in Burma.

Some time back, Thai authorities issued a decree revoking all logging concessions nationwide. Since then, there has been a rush by Thai businessman and bureaucrats to make timber deals with their counterparts in Burma and Laos.

Unlike India or Thailand large parts of Burma are still forested, with deciduous teak forests in the mountains and monsoon forest' in the south.These forests are a home.to many indigenous tribes whose very survival depends on the forests and its resources. They are also a home to hornbills,tapirs, rhinoceros, and wild elephants.

The military government in Burma has stepped up the export of Burmese hardwood to Thailand. According to news reports from Rangoon, Burma has already auctioned some U.S.$3.28 million worth of teak to timber firms from Japan, Europe, Singapore, Thailand, India and Hongkong. The current developments clearly indicate that logging activities will be intensified and if unchecked, Burma's magnificent forests will very soon be a thing of the past.

Khor Kok Peng
World Rainforest Movement
Source: 'Third World Network

A study by the Rocky Mountain Institute in the U.S. says that a massive worldwide nuclear power programme in which a transition from coal to nuclear electricity is completed by 2025 would not only not solve the global warming problem, it would actually contribute to the effect. This is because investing in nuclear capacity would preclude investment in more effective carbon dioxide abatement .strategies. The study finds that money spent in building nuclear power stations could do seven times as much good in diminishing greenhouse effect if it was invested in improving energy efficiency.

Source: New Scientist 5.11.'88

A Paradigm Of Plenty For Ever

We are in the midst of a major change in our way of thinking about energy, and for that matter about every other natural resource. The old (and still largely conventional) supply-obsessed approach to energy is running into more and more serious difficulties. A new development focussed paradigm for energy use and supply is emerging.

. The conventional "wisdom" on energy planning is as follows: development = growth = energy = centralised electricity generation and grid distribution.

Most of the steps in this argument are highly questionable, if not patently false. Development should not be confused with growth in the volume of goods and services. If development is to lead to reduction of poverty, then the structure and the content of growth, as well as the distribution of its benefits, should be seen as being as important as the magnitude of growth. The benefits of growth do not necessarily trickle down to the poor, because its main beneficiaries invariably turn out to be the affluent. Growth does not necessarily lead to development.

Two Conditions

The second step of the argument reflects the widespread belief that there can be growth if, and only if, there' are increasing inputs of energy. But this correlation is valid only under two conditions: There must be no changes in the product mix of the economy; (For example, there must not be a trend away from energy intensive to energy saving products and processes.) And/or there must not be significant improvements in end-use efficiencies. For if either of these changes take place (and both have been observed in modern times) then there can be an increase in the GDP despite a decrease in the energy consumption.

The third step, which equates energy with electricity, is illustrated with the fact that the , central Ministry for Electricity is called the Energy ministry. In fact,, till the oil crisis, energy planning used to mean electricity planning.

The undermining of the energy = electricity approach really began with the almost complete domination of the transport sector by petroleum. But, oil has also had a rising share in the domestic, industrial and agricultural sectors. Thus the assumption has grown that for most of these end uses there is no alternative to the use of petroleum derivatives. Hence, *a* modern addendum to the conventional "wisdom" on energy: development = growth = energy = oil = engines, furnaces, and other heating devices fuelled by petroleum,derivatives.

But, just as electricity is not merely large scale centralised generation and grid transmission, the use of petroleum derivatives is neither inevitable nor unavoidable: alternative devices can be fuelled with ethyl or methyl alcohol; cooking can be done wih producer gas or biogas; and furnaces can be run on producer gas generated from wood. The basic flaw in the conventional approach to energy described above is the implicit belief that energy is an end in itself. Further, by adopting growth as an objective, and then believing that growth requires increasing energy inputs, the emphasis turns to energy consumption and therefore to the projection of energy demand.

These projections are usually distorted by several biases:

1.Current growth patterns are socio-economically just and ecologically sustainable.

2. That the prevailing distribution of energy need not be" questioned .or modified.

3. That the current efficiencies of energy generation distribution **and**

utilisation will prevail even in the future.

Energy planning thus becomes an exercise in increasing energy consumption. in the search for energy supplies, the large scale sources inevitably attract most of the funds. Thus the vast differences between the budgets of the ministries of petroleum, coal, (electrical) energy, and atomic energy on the one hand, and the budget of the department of non-conventional (small scale) energy sources.

. Demand management is ignored and what is left is the energy version of the supply, side economics.If at all conservation and efficiency improvements are given any attention, it is only as after thoughts, add-ons and retrofits for cosmetic purposes.

The R & D is also largely restricted to the supply end of t.he energy spectrum, and furthermore to the large scale energy sources. In fact the end-uses and therefore the human aspects- of energy are not even considered to be legitimate subjects of technical study by the science and technology establishments.

Fortunately, this supply-sided approach to energy planning is breaking down. It is becomming clear that growth, unconstrained by equity and justice, bypasses the poor. If development is to be our goal, then the emphasis must be on the immediate and direct satisfaction of basic human needs, starting from the needs of the neediest.

The present patterns of growth are becomming unsustainable because they extrapolate to impossibly high Values of future demand. The easy sources of energy have long since been harnessed, and the remaining sources are becomming more and more difficult and expensive to tap. More dangerous and unforgiving technologies demand more stringent safety measures which are inevitably more expensive.

Marginal Cost

All this means that the marginal cost of generating the energy carriers (i.e. the extra cost of producing the next kilowatt of electricity or the next barrel of oil or the next tonne of coal) is increasing steadily. The real cost of energy is therefore increasing and at the same time there is increasing pressure to devote an ever rising fraction of public funds to energy generation.

The production of energy (electricity, oil,coal) is * also associated with environmental impacts. The victims of these environmental consequences are becomming the basis of growing protest movements. Whether it is a large scale hydroelectric project or a super thermal plant or a nuclear reactor, there is a rising storm of opposition. Finding themselves hamstrung the supply lobbies accuse the environmentalists of blocking "development", even though 'what is being obstucted is growth in the interest of the affluent. But actually it is the environmental impact of energy supply which is accumulating and gutting in the way of further increases in energy supply. Hydroelectric projects often require large scale destruction of prime forests and this destruction is said to diminish the rainfall upon which the projects depend.

Inefficient Use

Energy is used very inefficiently today. Hence there are tremendous opportunities for efficiency improvements. If such opportunities are seized, then growth will not necessarily require corresponding increases in energy supplies. And, using currently available energy supplies more efficiently may make more economic sense than generating more energy to sustain prevailing patterns of inefficiency. But as long as the preoccupation is with supply, the efficiency with which energy is used, will only be given peripheral attention.

From the standpoint of technical efficiencies, energy sources should be matched to energy utilizing tasks. And since these tasks are varied in nature, a mix of energy sources is invariably essential for an energy system. Although, electricity is the best carrier, the cost of transporting it do increase with distance. Hence beyond a break-even distance, decentralised generation from local sources may turn out to be more economical than the total generation plus transmission costs associated with centralised generation. It is in the context of this failure of conventional "wisdom" That a new approach to energy analysis and planning is emergi: g.

Hew Paradign

The essence of the new paradigm is that energy is only a means to an end, not an end in itself. The energy system must contribute to the goals of equity, economic efficiency, environmental soundness, long-term sustainability and self-reliance. This necessarily means an emphasis, not on energy consumption but on energy services, end-uses and needs. The spotlight in this new development fooussed end-use (defendus) approach is on human beings and the services that the energy provides for them, the tasks that it performs and the needs that it satisfies.

The starting point of the defendus approach is the detailed scrutiny of demand through a disaggregation of energy consumption beyond sectors and consumers to end-use devices and energy services. It may involve new carriers and new end-use devices.Even traditional carriers (e.g.biomass) may have to be converted into new forms (producer gas) or utilized in improved devices. Energy consumption must also be disaggregated beyond consumers in order to determine who are the beneficiaries of energy supplies and whether current distribution patters are consistent with development.

A central and integral part of the new paradigm' is the conviction that energy sources are finito and their extraction involves both economic and environmental costs. Consequently, in every attempt to maintain or improve energy services, a decision has to be taken whether to go in for efficiency improvement or For supply increases or for a mix of both. It is quite irrelevent whether these services are provided through improved utilisation technologies, or through energy supply schemes. Both have to become open contenders for the provision of energy services.

Decision makers must . therefore summarily reject all proposals that are exclusivly devoted to either supply or to conservation. The only one that should be tolerated must be proposals for the provision of energy services, and in these proposals both the options of energy conservation and energy supply (as well as combinations of supply and conservation) must be treated explicitly and compared fairly.

Bright Future

In the past, projects for supply increase have been the reflex-like response of the energy establishment. Efficiency improvement proposals have emanated from outside the establishment. This bias may have been justified when the demand was low, capital was in plenty and there was no urgency. But recent analysis both in other countries and in India, shows in case after case, that it is far cheaper, quicker and environmentally sounder to use energy more efficiently than to increase supply. Very approximately, it is two to three times costlier and it takes three to five times longer to generate a megawatt than to save it. For example, a 30% saving in power corresponding to 120 MW can be achieved by introducing in about 1-2 years simple efficiency improvements in Karnataka's 500,000 irrigation pumpsets at a total cost of about Rs.50 crores, but it would take Rs.120 crores and 5 -10 years to construct power station facilities to generate 120 MW. In this example efficiency improvement cost about Rs 42 lakh per megawatt compared to about Rs.1 crore per megawatt for generation.

There are innumerable other possibilities. There are enormous saving possibilities through the use of solar water heaters and fluorescent lights in all-electric homes which .consume 15% of Karnataka's electricity, and through fluorescent lights in non-AEH homes (which account for 7% of consumption.) The magnitude of energy demand depends very markedly on what efficiencies are assumed for energy generation, transmission and utilisation. Hence, it is only after decisions are taken regarding the generation-conservation options that a picture'of future energy demand can be sketched. But to the extent that the efficiencies are matters of deliberate implementation, future energy demand is a matter of choice, not destiny.

In . taking these decisions, a crucial goal is to minimise the environmental impacts of energy generation, transmission and utilisation. The old bias for supply increases through centralised non-renewable sources has to give way to unbiased decisions between:

1. efficiency improvements vs supply increases
2. decentralised vs centralised production
3. renewable vs non-renewable sources of energy

The decision makers must be neutral umpires rather than partisan supporters. These choices are mutually related. With increasing efficiency, the magnitude of the final demand decreases and with decreasing final demand, a greater variety of supply options (especially those related to decentralised renewable sources) become serious contenders for providing energy services. Thus, . the outcome of the defendus analysis and planning is likely to be a lower cost, quicker, environmentally sounder, sustainable solution to the energy problem. What is likely to emerge is a solution that is not only consistent with other societal problems but also one that points to a brighter future.

Dr.A.K.N.Reddy
Indian Institute of Science
Bangalore

Enough For Everyone?

We have become used tb living in an era "where the resources no longer limit decisions but rather the decisions make the resources." The attainment of escape velocity in development has resulted in a tremendous guzzling of energy resources. Half of all the energy consumed by humans in all history has been done within the last hundred years.

Such an increase in energy consumption has lead to a deterioration of the environment. Today India consumes between 200 and 300 million tons of firewood every year. This means that nearly 700 million trees are being cut every year only to meet cooking and hot water needs. Fortunately a good part of it comes from barks and twigs in village woodlots, minor forests and roadside plantations.

A good housewife will balance her budget within the monthly income of her family and only under emergencies will she dip her hand into the storage kitty. This prudence introduces longterm stability into the lifestyle of the family. A similar approach is necessary in energy planning for a district or a state or the country.

Instead, what we have in the name of energy planning today in the country is pure . chaos. There are as ' many organisations dealing with different aspects of energy as there are energy sources and end uses. Thus, Coal India "produces" coal; Oil India and ONGC "produce" oil; Nuclear Power Corporation and the State Electricity Boards "produce" electricity: many agencies manufacture end use devices like motors, pumpsets, furnaces, stoves etc. In this maze of organisations and agencies there is no integrated approach to energy planning. People calculate growth rates for each fuel and project it for many years. Then they look around for additional supplies* to meet these projected demandemands This supply and demand based "planning" is done for each individual energy form. Because of this lack of coordination and the total absence of an integrated approach to energy planning we get many situations,of wasteful energy use. Mr.S.G.Ramachandra, an eminent energy specialist, estimates that the energy consumed by individual household pumps to lift water from .a sumpwell to an overhead tank in Bangalore city is nearly twice that used by the water supply board (BWSSB). Thus, proper availability of supply of power to BWSSB and well maintained pumping heads, can very easily reduce this wasteful energy consumption by individual households.

Despite all the additions to the generation of electricity from newer power " plants there continues to be a shortfall between demand and supply. And this deficit is projected to continue and even increase for many years to come! Thus power cuts have become and Shall remain a way of life. Industries use captive diesel sets to generate electricity in their own premises in order to meet their demands. During a survey we found that in Karnataka the industries sampled by us produced about 40% of their electrical energy from diesel sets.

Thus, any deficit in one form of energy (e.g. electricity) leads to substitution by another form (e.g. diesel). This substitution has reached enormous proportions that today not only industries but even shops and households are buying diesel generator sets. Hospitals, computer centres and other similar institutions are forced to own their own uninterrupted power supply to run their equipment. The cost of power supply is of ten more than the cost of the equipment. This situation coupled with the disappearance of forests, wood-lots and roadside trees is conclusive proof if any proof were needed of the absurdity of our energy planning.

Whenever we convert energy from one form to another, the full energy content is not converted into useful form; some energy is invariably lost. In other, words, no device can be 100% efficient. This fact illuminates another facet of the energy planning problem. There ought to be minimum conversions of energy between different forms since each conversion implies waste. Energy sources need to be well matched to end uses. For example, electricity is a very high quality energy whereas agrowaste or dung are of lower quality. End uses can be categorized according to then quality requirements. At the' lower end is low temperature heating (bath water). Next in ascending order are cooking, high temperature heating, metallurgical furnaces, very high temperature heating, lighting, movement, electrochemical activities, etc. We have tried to maximise the efficiency of many different sources like biogas, firewood, solar energy, electricity, kerosene by properly matching them to various end uses like cooking, lighting, irrigation, transport, industries, etc. The model gives us a plan for use of each type of resource and an optimal path. For example the plan suggested use of electricity for lighting instead of kerosene. The study showed that the optimal path resulted in an order of magnitude (a factor of ten) reduction in the energy costs per household.

An ideal energy planning strategy ought to have the following objectives:

i. Maximize energy conservation,
ii. Optimize energy source - end use matching.
iii. Maximize use of renewable resources.
iv. Penalize use of depletable resources.
v. Maximize production of renewable resources like biomass.

Users of energy are very diverse ranging from individual families to commercial units, small industries, transportation systems and **large** industrial complexes. Hence any reduction in energy use and the consequent **increase** in efficiency requires very' **strong** motivation amongst many. Actually, in our social system we have disincentives. 'A major disincentive is the price of energy. Our energy is heavily subsidised. Large subsidies result in a wasteful consumption of energy. Curious situations obtain. A dichotomy can be seen from the following example: whenever an electricity board increases the tarriff, the industries, and their representative organisations voice a very strong protest saying that the costs of their products will increase and they should **get** subsidised energy. (This despite the fact that an many industries the cost of energy! is less than 10% of the cost of production.) But, on the other hand, whenever there is a power cut, these industries have happily switched over to captive diesel generation unmindful of the fact that the cost of electricity from such sets works up to about two Rupees per unit compared to the cost of grid electricity at around 40-60 paise per unit. (Until recently the cost of grid electricity was five paise per unit for industrial establishments.)

Let us now look at the following two questions:

. Are there sufficient savings available by energy conservation that we can aim for zero growth rate even though our per capita consumption is very low compared to industrialised countries?

ii. Is there sufficient potential of renewable energy sources so that we can look for meeting our energy needs from renewable energy sources only?'

Questions like does increase in energy consumption lead to development etc. 'are not discussed here.

Comparisons of Energy **Use**

We shall start looking at the first question by first defining certain parametres for comparison and then by comparing Karnataka's specific energy consumption with that of industrialised countries.

There are many indicators to compare lifestyles in various countries. Energy consumption plays an important role in indicating lifestyle. Initially energy consumption was compared with a country's gross domestic product (GDP). Later, energy consumption/capita was plotted against GDP/capita. It was found that there is a strong multi-country correlation existing between national output per capita and energy use per capita. Table I which gives the energy-output relationships for six industrialised countries and Karnataka state illustrates, that Karnataka has very low energy/capita and GDP/capita values. But these do not reveal the true state of energy use; what one would like to know is what is the level of efficiency? Normally it is said that since our energy use/capita is low compared to that of the 'advanced' countries we should increase our energy production so as tor reach the levels of the advanced countries. It is assumed that the energy/capita reflects the true state of the development of a country.

Country	GDP/Capita (dollars) Index	Energy Cons./ Capita (toe)	Energy/6DP	------- toe/at
U.S.A.	5643	8.35	**1400** 1772 795	190 120 54
Canada	4728	8.38		
France	4168	3.31		
W.Germany	3991	4.12	1831	70
U.K.	,3401	3.91	1121	76
Japan	3423	2.90	849	57
Karnataka	696.05	0.444		493
*?4-*75	(Rupees)			
Karnataka '79-'88	728.8 (Rupees)	0.492	8893	547

Table I : Energy/Output Relationships
toe/ $: tonnes of oil equivalent / million dollars

Recently there has been a shift" in thinking even in the industrialised nations. The important index is that which reflects the efficiency of energy use. This index is not energy/capita but rather energy/GDP This is given in column 4 of table I in absolute terms and in column 5 of table I in relative terms compared to U.S. as standard.One finds that Karnataka is using five times more energy compared to U.S. for producing the same output. The-comparison with France or Japan is even worse. Two points need to be mentioned about this table. First, it does not include human or animal energy. Our society uses more of these forms of energy. Secondly, most of these countries require a large amount of energy for space heating during winters due to unfavourable weather conditions We are fortunate in having an warme climate and require little space heating. If adjustment is made for both these factors, then the energy/GDP index for Karnataka becomes even more unfavourable.

Next, we take a closer look at industrial energy consumption. Table II is a comparison of industrial energy/, industrial GDP figures of different countries and Karnataka. One finds that in karnataka, industry is consuming 8.8 times the energy by U.S. industry for the same output. This definitely reveals the enormous possibilities of improving energy conservation in our industries.

Country	toe/es Industrial 6DP	Index	Electricity as a *X* of energy in Industries
USA	1427.7	108	17.3
Canada	1777.2	124	21.8
France	574	48	15.1
W.5eraan	736.6	52	16.0
y	1146.1	98	'4.8
U.K.	924.t.	65	20.0
Japan	12615	884	
Karnataka 74-75	8105	568	69.0
Karnataka			

Table IhEnergy Consueption in the Industrial Sector
All prices adjusted to 1972
toe/a s:tonnes of oil equivalent aillion dollars

Column 3 in table II is the quantum of energy consumed by industries as a percentage of total industrial energy. We find that despite power cuts for the past many years the share of electricity in Karnataka's -industrial cake is much higher than what obtains in industrially advanced countries. Electricity - a very high quality source - is being used for lot of low or medium temperature heating by industries in Karnataka. This wasteful application is taking place not. because electricity is efficient, but because it is convenient and has been priced to be cheaper than other fuels. The comparisons of table II were done for the year 197)2 - before the start of the oil crisis. Since 1973 many of these countries have gone in for energy conservation in a big way.

Detailed studies have been done regarding specific energy consumption - energy required to produce one unit of an item. .These studies have been done on various industries like engineering, chemical, metallurgical, paper, textile, sugar,etc. These studies cover a period of many years. Two interesting points emerge. First, there are large differences in energy consumption per unit of production within each sector. Thus, one paper unit uses 17245 units/unit of production whereas anotjher manages to make do using 12510. Similarly in textiles the values range from 5345 to 8102. Secondly, observed over a period of five years from 1979 to 1984 many industries have become progressively more inefficient. In 1984 for example, the heavy engineering industry was using more than one and a half times the energy to produce the same amount of goods that it did in 1979.

From all this we are led to a conclusion that there is a very large potential for energy conservation I in Karnataka. It is good to recall he an estimate of the National Productivity Council that we can reduce our consumption very easily by 25% | by incorporation os simple inexpensive strategies in our energy use.

Renewable Energy Resouroes of Karnataka

Having set the stage by first looking back at our energy consumption strategies and then at possible improvements in the efficiencies of use, let us now consider the second question. How do we meet our additional demands) , if any? Are there enough renewable energy resources to meet this? !

The first point that we ' should clarify here is that many of us' confuse energy with electricity. Even a cursory look at Karnataka's energy scene would tell us that electricity accounts for less than 20% of the total energy consumption. Even amongst commercial **energy** sources electricity cones second after oil.

Source	Potential/Year (MKW-Hours)
Agricultural residues	**50,000**
Biogas (Animals)	11,790
Biogas (Sewage)	500
Major Hydro	14,500
Microhydel on Canals	800 - 3200
Microhydel on Streams	Not Known
Solar	5000 -10000
Wind	40,000

Table III Potential of Renewable Energy Sources in Karnataka

Table III gives the available potential/year for renewable energy sources in Karnataka. The present annual energy consumption in Karnataka is around 35,000 million units. We see from the table that this requirement can very easily be met from the renewable resources. Actually the potential available is quite large compared to the requirements.

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Global Warming Threatens Nuolear Plants

According to an article in the British Journal **The Ecologist,** nuclear power plants situated mostly in low level coastal sites in many countries are likely to be inundated by the rise in sea levels as a result of global warming caused by the greenhouse effect. Sizewell and Bradwe11 stations, located in East Anglia in the UK are especially at risk. In 1953, sea levels **there** had risen by up to four, metres, producing widespread flooding. Sea levels in East Anglia are rising twice as fast as the global average due to subsidence. Flood emergency plans do not specifically cover nuclear plants.

Storm surges powerful enough to knock out a nuclear plant's auxiliary power systems could, in the extreme, cause several major system failures at once. In the case of a defuelled reactor (in the early stages of decommissioning), flooding could cause the release of radionuclides from less well protected facilities. Seawater would cause corrosion of concrete structures. Even without flooding, raised sea levels could raise water table levels and lead to the intrusion of saline groundwaters, which could then attack the concrete base of a reactor's containment building releasing radionuclides into water resources inland.

Although somo precautions are being taken at coastal sites in UK, the East Anglia sites are especially poorly defended. At Sizewell, dunes are being reinforced to a height of ten metres above the sea level - but the 1953 surges would have reached nearly half this height and given their force,could have breached them. By the time the decommissioning of Sizewell B is due to be completed in the early 22nd century, sea levels are predicted to have risen by up to two metres. This figure does not take into account the melting of the West Antarctic ice. It is obvious that the risk to reactors from flooding and damage from surges- and saline groundwater intrusion will increase considerably.

The cost of adequate sea defenses and other on-site measures which might reduce (though not necessarily prevent) the risks to a nuclear plant over the 130 years of its operation and decommissioning, would add enormously to nuclear costs. But anyway there is no evidence that such considerations have been taken seriously in siting policy by any nuclear authority anywhere.

Source: WISE News Communique 311.3105

Editor's NoterTarapur and Kalpakkam are already built and in operation. Urgent safety measures need to be taken to help reduce risk there. However, it is, downright foolhardy to plan further coastal constructions without taking greenhouse effect into consideration. Jaitpur and Koodankulam take note.

Disorder In The Deep

The Rational Idea

The ecosystem is composed of the natural , interwoven, ecological cycles and provides all the resources that support human life and- activity. The production system is the man made network of labour processes and technology that converts the resources into goods and services - the real wealth that sustains society, the economic system is the recipient of this wealth and governs the manner in which it is distributed to the members of the society

Energy flows within and between the three systems play a leading role in integrating them together. The quantum, the quality and the pattern of these energy flows greatly condition the nature of the interaction between the systems. It is logical to .expect the economic system to confirm to the requirements of the production system **and** the latter to the requirements of the ecosystem. Anyway, that is the rational idea. With this logic in mind let us look at the marine fisheries sector in Kerala.

The Low Energy Sector

In Kerala, the marine ecosystem is blessed with nature's bounty of a high quantum of stored solar energy in the form of fish. It is assessed that the annual sustainable, free flow from this ecosystem is a little over 30 tonnes of fish per square kilometre of coastal sea area - or an equivalent of about 720 million kilo calories of energy. The potential in other parts of India is only between one half to one third this level. Kerala's coastal area measures 12570 square kilometres and this places the maximum sustainable yield (MSY) per annum around. 380,000 tonnes of fish.

This potential of stored energy was initially converted into a resource by a traditional community of fisherfolk who lived by the sea and laboured on it. They used low energy, low entropy production system with artefacts manufactured and operated using renewable sources of energy. The resource was in turn converted into wealth through an economic system which was **also** low in energy Use and largely dependent on solar and human energy.

This scenario was a familiar scene in Kerala as recently as a decade ago. Fishermen on elegant, sail-powered canoes laden with a catch of fish heading for the shore. The waiting fish distributors women and men - who moved the fish to neighbouring markets carrying it in baskets on their heads or the back of bicycles. They took the fish to the market in the fresh state or after drying it in the Sun. .

These were the concrete expressions of the low energy consuming but highly efficient' chain of interaction between the ecosystem, the production system and the economic system. The methods of fishing were "passive and selective". They caught fish without disrupting the ecosystem, the fish catch per fisherman was low - well within the sustainability of the ecosystem. The price of fish was low and hence incomes were meagre. The level of disparity between participants in this economy was also low. The fishery was largely dependent on other local and national sectors of the economy for supply of inputs (wood for crafts; cotton for nets; rice, tapioca and other provisions for food; clothes etc.) and market for Its fish - the bulk of which rarely moved to markets beyond 20 - 50 kms. of the landing centre.

This was by no means a Utopia. There was exploitation. Lack of basic necessities and amenities for a full human existence were well apparent. Fisherfolk were however in full command of the production process.. Nature was not an entity outside their frame of life. The Sea was the Mother and they were her children. They well understood the ecosystem with which they interacted and possessed a pragmatic and holistic perception of it. The production system and the ecosystem were in harmony. The economic system, though limited in its spatial extension was however outside their control. They did not perceive it to be overexploitative and were hardly prepared to change it through collective action.

The High Energy Seotor

A new pattern of fisheries development undertaken at the initiative of the state, but driven primarily by the international market forces, was imposed upon such an economy.

On land it was possible to intervene in the ecosystem to raise its productivity by using energy additives (fertilisers) or energy aggregators (greenhouses). Such options at sea were limited. There was a fallacious yet strongly held , belief that sea was an inexhaustable biomass of fish. This provided the rationale for an excessive concentration on introducing technologies in the - production system for **harvesting** the sea more effectivly. Moreover, since the sea was considered a "free for all' terrain - a common property resource - this seemed the most sensible option available.

A big leap in the harvesting power of the fishing units resulted. Crafts powered by renewable energy sources and employing a range of passive and selective fishing gear were set aside. Instead mechanised grafts with single, active and non-selective fishing gear were preferred. Trawlers and purse seiners are two examples of these craft types used for fish harvesting under this new "planned fisheries development" regime.

There is one important dimension about these two sea harvesting artefacts which rarely gets highlighted. They were invented for an ecosystem (temperate zone sea) with a totally different energy configuration compared to the ecosystem (tropical sea) into which they were introduced.; Like any other exotic, **they were prima facie unsuitable in** uncontrolled numbers.

In the activities of processing and marketing, new technologies were introduced that resulted in a quantum jump in non-renewable energy use. Freezing, canning and the use of ice for preservation expanded the shelf life of the fish and thus immediately opened up possibilities of long distance marketing. This in turn became feasible only with the use of fossil fuel powered transport like insulated vans, refrigerated railway wagons and cargo ships.

The new energy and capital intensive technologies initially increased the labour productivity. It became possible to "dominate" and "exploit" Nature with them. The harvest of fish was soon above the desired levels of sustainability. The value of the output increased sharply consequent to the export orientation of the harvest from the sea. The incomes of those who utilised these technologies also increased. (In Kerala only between 10% - 15% of the fishermen work on mechanised boats.) Disparities between the owners of the new artefacts and the rest also widened. The dependence of the local fishery on the national and the international economy became greater both for the supply of inputs and as a market for outputs. The active disruption of the, marine ecosystem was on the increase: trawling resulted in indiscriminate damage of the aquatic milieu and purse seining overfished to the point, of species genocide.

The High Entropy Scenario

Until 1969 the fish catch in Kerala was below the annual mean sustainable yield (MSY) of 380,000 tonne. This harvest was made exclusively in the coastal waters and 95% of it by the traditional fishermen using 24,000 non-mechanised crafts. My rough estimate 'is that for every unit of energy input into the production process (the metabolic energy equivalent of the labour of the fishermen measured in Koal.) the output was between 40 to 80 units. (The energy in Koal. from fish.)

Between 1971 and 1974 the fish harvest rose above the MSY. It averqaged 400,000 tonnes and rose to 448,000 tonnes in 1973. The mechanised boats - now

predominantly trawlers - accounted for *23%* of the fish harvested in 1974. Their harvest was composed of prawns and large quantities of bottom dwelling species of fish caught along with it. This spurt in the harvest of prawns came as a result of consumers in developed countries with high energy luxury diets exercising their power on the economic system. Prawn prices on the seashores of Kerala increased from Rs.10,000/tonne in 1970 to Rs.20,000/tonne in 1975. The common property character of the sea, the encouragement by the state and the big profits to be earned from the "pink gold" resulted in an influx of trawlers owned almost wholly by non-fishermen. The trawler fleet increased from • around 700 in 1969 to over 2400 by 1975. An important energy issue which also had a strong influence in creating this situation was the rather low prices of petroleum products. The HP ratings of the engines used in the mechanised boats were also significanly above their necessary requirements. But a more powerful trawler could rake up the bottom of the sea more effectively thus enhancing the share of the prawns in every haul of the trawl net. The disorder and the damage this created in the sea bottom was considerable. Nature was wounded, but then Nature never reacts to her wounds immediately, and when she does, it is not always those .who cause the harm who suffer the most!

After 1975 the total fish harvest in Kerala began to register a decline. Prawn harvest also dropped significantly. In 1980 the fish catch was as low as 280,000 tonnes - the lowest since 1963! Prawn production dropped from the peak of 77,000 tonnes in 1975 to 30,000 tonnes in 1980. The price of prawns however, continued to soar reaching a new height of Rs.46,000/tonne in 1980. Despite this overall decline in the fish harvests, the catches made by the trawlers actually registered an increase, implying that it was a large number of traditional fishermen who suffered the most..

So, despite increased fuel prices after 1973, enhanced investment costs and rising running expenditure, the number of trawlers in Kerala continued to rise. In 1902 it had crossed the 3200 mark. Energy balance too became increasingly adverse. While several traditional non-mechanised fishing techniques maintained a ratio of output to input energy between 20 to 60, similar analysis in the case of trawlers gave a figure of 0.5 -a negative balance!

	Low Energy Sector		High Energy Sector	
Year	**Productivity Kg/Year**	**Income* (Rs.)**	Productivity Kg/Year	Income* (Rs.)
1961	**3540**	**330**	**NA**	**NA**
1965	**3820**	**380**	**NA**	***NA***
1969/70	**3340**	**630**	**5150**	**790**
1974	**3200**	**870**	**10040**	**5060**
1979/80	**1780**	**540**	**7540**	**2630**
1982	**1620**	**420**	**7700**	**1560**

* Income adjusted to 1960-61 prices

Table I Estimates of Productivity and Real Incomes of Fishermen in the Low and High Energy Sectors of Kerala's Fish Economy.

The increased energy use and the high levels of disorder created very significant disparities: (i) that between fishermen using renewable energy technologies and those using mechanised crafts; (ii) that between fishermen workers as a whole and the class of owners of mechanised crafts Who were all non-fisherfolk.

In table 1 we see that between the years 1961 and 1982, the physical productivity as well as the real income of the fishworkers within the two sectors, first rose and then dec lined. The incomes and the productivity levels of the high energy sector were generally significantly higher than that of the low energy sector. However, the rate of decline of the incomes in the high energy sector is more rapid although the converse is true with physical productivity

Beating Entropy and Inequality with More Energy?

The disparities that arose as a consequence of the high energy, high entropy state of Kerala's fish economy gave rise to two important responses on the part of the fishworkers. The first is by now well known: The militant unionisation of traditional fishworkers. The greatest achivement of this "blue political movement" was its ability to extract a reaffirmation from the state that the exclusive access to the coastal waters was indeed their traditional and historical right.

There is however a lesser known response. From our perspective it is the more important. This has to do with the initially slow - and - cautious but subsequent tidal-wave-like shift towards using outboard motors on traditional crafts. In my opinion' this . trend frittered away the gains achieved by the political movement.

In 1980 the first commercially marketed outboard engines were sold to fishermen in the central regions of Kerala.By 1982 the number of motors used on traditional crafs in the whole of Kerala was around 2,000. By mid-1988 it was estimated ' that over 75% of the active fishermen were using the now ubiquitous outboard motor. We have here a revolutionary change in the technology configuration, a drastic change in the composition of energy use. and the energy balance. This was coupled with a concomitant rise in costs.

Fishermen have been caught on the one, hand in an upward increasing spiral of rising HP ratings on their engines, increased investments in their fishing gear and higher energy costs. On the other hand, it has been a downward spiral in relation to the fish harvests. They have 'lost their earlier knowledge and the control over the production process, virtually handing it over to multi-national corporations. Harmony has been ruined. Armed with mechanised power they also began to use more active and non-selective fishing gear which for all practical purposes were merely smaller versions of the destructive purse-seine nets used by the larger mechanised vessels.

In order to beat the entropy crisis the fishermen have sought to expand' life beyond the radius of tradition by a total shift from metabolic and renewable energy to a state of almost exclusive dependence on non-renewable energy and mechanical power. Fishermen, who less than a decade ago were the best sailors have stopped using sails altogether. Rowing is ofcourse totally out of the question. Enslavement to the outboard engines is by now almost total. More such gadgets await their turn in the pipeline. The multi-nationals which market these artefacts have acquired the ability to create and shape the basic needs of the working fisherman .into something which the multi-national alone can satisfy The hold of the multinationals on the labour power and the labour process of the fisherfolk is complete.

An inquiry into a cross section of the fishermen has revealed that in their opinion the most important feature of using the outboard motor was the reduction in the drudgery and the physical strain of their work. Surely this is an important and laudable goal to be achieved? The- real question that needs to be asked however is, whether this reduction in drudgery has resulted in a greater range of fishing operations, higher incomes, more comfort, less alienation and enhanced sustainability.

The evidence now being gathered points to a situation where the above list of desirables is hardly visible on the horizon of the vast majority of the fishermen in Kerala today. In dust eight years they are bonded to an economic system which determines both their choice of technology and the prices of the product of their labour. There seems to be no possibility of going back to a more sensible energy balance. They are caught in a downward vicious spiral. This is forcing them to ruin the ecosystem on which their long term future depends. It is on this score that Kerala's fishermen can be said to have won a battle but lost the war.

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LETTERBOX

As far back as 1953, the Swedish Fuel Commission in a preliminary report initiated a move to put a break on the over-dependence on non-renewable energy resources like oil and instead advocated active energy saving measures by way of encouraging insulation of dwellings, developing wind power machines and solar domestic heating systems. But by the time the commission submitted its final report in 1956 its enthusiasm had evaporated. The industrial mandarins had managed to hijack attention to nuclear power as an omnipotent and everlasting alternative to oil.

Godfrey Boyle has remarked that non-renewable energy sources have a unique characteristic eminently suitable for exploitation by the ruling oligarchies for the furtherance of their interest and hegemony. Fossil fuels are accumulated.. in specific locations and thus can be easily appropriated by them. Renewable energy sources have an egalitarian . Character being pretty evenly, distributed around the world. Their low concentration prevents easy exploitation

According to Ralph Nader, and John Abbots, the inexhaustable source of solar energy was, to the power holders, "an ugly duckling whose eggs were never to be hatched." Since solar energy resources can be provided at individual dwelling sites, they are under the individual's control and management and hence beyond the control of utilities or governments. Since the 1950s fossil fuel stocks have started dwindling at an ever increasing rate. Uranium has managed to fit into this existing politico-engineering framework to cater to the hegemonistic world view of the powerful.

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The struggle for housing - for a place to live in security and dignity - is one of the most basic (if unrecognised) struggles that all- people are engaged in. It is in terms of this struggle that people at a mass level can be made concerned about and involved in, the intense and ultimate contradiction to life that nuclearisation represents.

Nuclearisation inherently increases the level of hazard in our environment and therefore intrinsically contradicts the right of every woman, man and child to live in security and dignity. There is therefore an undeniable need for those of us interested in the right to housing, to very critically assess the situation, so as to intervene effectively in the public interest.

It is our belief that people, in general do not and will not become concerned with abstract questions of environmental risk'. Such questions' will only concern them if it is related to what they do in ordinary life. Housing is one such activity - basic, continuous, unrelenting, unrecognised but known intimately to all ordinary people. It has tremendous potential as an entry point and as a point of integration and insight.

Finally, we are working on the hypothesis that nuclearisation today has been successfully made almost a patriotic goal. To question it, bring a reflex reaction not about the merits of the argument but about the motives of the questioner. Therefore, we feel that it is first necessary to marshall and put forward information and to use such information actively and purposefully.

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Shri Laxmi Narain Modi, Director, Nation Building Forum has sent us copies of his interesting correspondence with the authorities on matters relating to nuclear power plants. We will continue to Pablish excerpts from these letters. Asking the government to justify its policy is an important means of demonstrating public awareness.

"Recently, the proposal to store hazardous chemicals atop Antop Hills near Bombay has been rejected by the expert committee appointed under the directions of the "Supreme Court. The Honable Court stated:
"The fundamental right to live also includes the right to a clean environment."

There are many reports that even while the atomic plants are operating normally, they do cause lot of environmental disturbances.* Under the newly enacted Factories Act, it is the responsibility of the management to give full, information not only to the workers but! also to the people in the vicinity about the dangers involved but regretfully no such information is being given by the DAE. There is more of concealment than disclosures of correct information.

Even with regard to the economics, nuclear power plants would not be economic when it is clear that their life is only about 25 years whereas radioactive wastes are a threat for thousands of years. It is therefore important, that before any atomic power plants are made critical, there should be satisfactory plans for waste storage ana true details of the costs should be known to the public. Otherwise there is no advantage in going in for such high investment technologies."

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Cycling Out **of the Greenhouse**

A report by Ian Grayson for Friends of Earth - Australia, reminds us of the role played by the transport sector in causing the greenhouse effect. A switch in transport priorities by the industrialised world to bicycles and public transport would reduce the greenhouse threat substantially. Cars account for 17% of all atmospheric carbon dioxide released by fossil fuels.
Source:WISE News Communique 304

Subscription Rates:

Rs.25/- per year South Asia
U.S.$ 15/- per year airmail overseas
(Rs.200/- per year if paid.for in India)
please add Rs 6/- for cheques

Editor : Surendra Gadekar

Subscriptions, donations, manuscripts, enquiries regarding circulation should all be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi via Valod, Dist: Surat
Gujarat 394641

Published by S.Gadekar for Sampoorna

Kranti Vidyalaya and printed by him at
PRINTED HATTER BOOK POST

The Progressive Printing Press, Surat.

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Volume 2 Number 5 **April 1989**

> "What happens in the Pacific *is* usually
> told from the oppressor's point of view,
> because we don't have access; to write our
> stories., we don't have access to
> resources to travel, we're, not recognised
> as a people that should be talking about
> what really happens to us."
>
> Titewhai Harawira

Talking about human rights is 'in'; especially for governments. Taking concrete steps to protect the rights of the weak and the dispossessed is not so in especially if there is clash with perceived military interests.

This year we celebrate the two hundredth anniversary of the French Revolution. That revolt of the poor and the downtrodden which established human rights as an. article of state policy. A revolt which forced all governments ever since to derive their legitimacy not from divine- dispensation, but rather from the 'will' of the people. An inspiration to all who desire a more just and equitable world order.

The month of July also marks another, little noticed, anniversary; on July 2nd 1966 France exploded its first nuclear bomb in the Pacific. Despite worldwide condemnation the French government has continued exploding its bombs ever since. The latest of these tests, the third this year, was held on June 11th. Till today 145 nuclear explosions have already taken place on Moruroa and Fangataufa atolls. (41 in the atmosphere and 104 underground). Moruroa atoll is known to be sinking. Strong evidence links an increase in fish poisoning to French testing. Cancer statistics are marked "classified information" and are withheld by France.

Governments have come and governments have gone; the nuclear nightmare of the Pacific rolls on. For the past eight years, France has had a 'socialist' president. A person who was once himself a victim of Nazi persecution. One would expect that at least this administration would be more respectful of human rights ot others. But no, nuclear ambitions - ambitions which are ridiculous in the final analysis - reign supreme.

. In an earlier issue (Anumukti Vol.2 No.1) we have commented on the nuclear imperialism practised by the Americans in the Pacific. Their barbaric actions have brought disease, disability, dislocation and a loss of dignity and culture to a simple, peaceloving people.

The Pacific islands occupy a very special place in the collective conciousness of mankind. Their bountiful yet simple lifestyle has been a source of attraction and inspiration to many. Paintings of Paul Gauguin depict a world close to paradise. It is an obscenity that this paradise has been turned into a living hell by the inheritors of the French and American revolutions.

Celebrations of the revolt of the poor by the rich are a mockery of the revolution. It is only when all the exploited and oppressed peoples of the world, in Pacific and elsewhere, can live a life of dignity and self-respect that the French" Revolution would be truly celebrated.

Nobel Prize Nomination

Anumukti endorses the nomination of Belauan activist groups Ketal Reng and Otie A Beland for the Nobel Peace Prize 1989.

The determination and steadfast resolve of the people of Belau to retain the antinuclear provisions of the constitution of their island reprblic in face of massive US pressure, has been a shining example for all the people of the world. (See Anumukti Vol.2 No.1 for a detailed report) Indigenous people can take special pride in this struggle of right against might. Indigenous people everywhere as also the Adivasis of India have been special targets of policies which promote location of dangerous industries in the name of development.

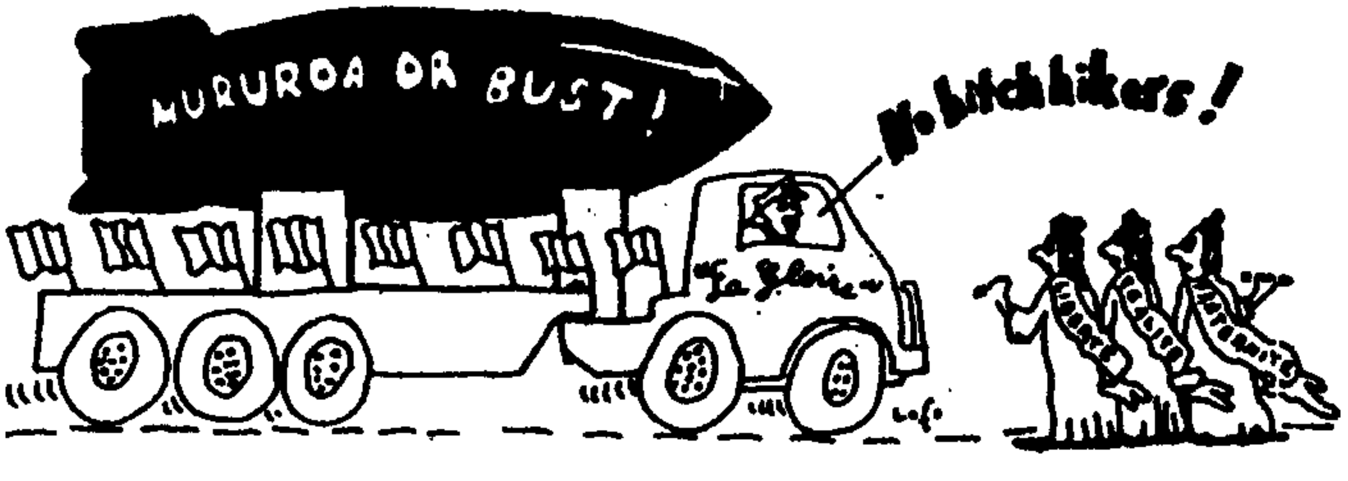
Nuclear Testing Kills in Surprising **Ways**

"Cignatera" is the name of a disease once rare in the Pacific. It results from the eating of a certain species of fish which inhabits coral reef waters Common symptoms of the disease are vomiting, diarrhoea, disturbances in balance and coordination and in severe cases death due to respiratory failure.

While the exact mechanism and the ecological pathways are still a matter of debate and further research, the culprit seems to be a certain species of plankton which is the fish's food. Nevertheless what is beyond dispute is the fact that wherever the reef ecology has been disturbed by nuclear detonations and military operations, -this form of food poisoning has increased rapidly.

Between 1960 and 1984, the annual incidence of Cignatera poisoning rose tenfold in French Polynesia, peaking in the early 1970's at 12 per 100 inhabitants. On Hao atoll in the Tuamoto Islands, Cignatera was unknown before 1965 The (disease first occured one year after the French used the island as a base for their tests at Moruroa and Fangataufa. By mid-1968, it had affected 43% of the islands 650 inhabitants.

Source: WISE News Communique:309


MURUROA OR BUST!
No hitchhikers!
La Gloire

"For The Good Of Mankind"

Gigantho stone statues with long ears and expressionist faces stare solemnly at visitors to Rapa Nui, known to the world as Easter Island because a European ship "discovered" it on an Easter Sunday. The island is perhaps one of the loneliest places on the globe. It has attracted scholars due to its strange archaeology. Today, Rapa Nui is one of the emergency landing sites of the US space shuttle programme.-

Elusive Peace

The Pacific: covers nearly one third of the earth's surface. Its waves play on the shores of some of the most economically and militarily powerful nations. Heavy battles were fought here during World War II. Ever since, despite its name, the Pacific region has never returned to a peaceful state.

The Polynesian queen of Hawaii was overthrown by the U.S.A. in 1893. It is today the 50th state of the U.S. with 110 military installations, control facilities for conducting nuclear wars and nuclear arms bases. Micronesia, after experiencing frequent change of colonial 'masters' was finally given to the U.S.A. as a strategic trust territory by the United Nations Security Council. The trusteeship agreement required the US government to " promote the development of the inhabitants towards self government and independence against the loss of their land and resources". However, a year before this agreement the U.S. had already detonated nuclear bombs on the Bikini atoll in the Marshall Islands. The people of Bikini were told, " We are testing these bombs for the good: of mankind, and to end all wars". They agreed to being moved away from their island " for a short time" and were consequently relocated on an uninhabited island. When the U.S. navy remembered them a year later, they found them starving on the infertile island. So, they were relocated another time. Today U.S.A. is in the process of releasing Micronesia into something less than complete independence. It want; to keep the right to use the islands for its own purposes but at the same time does not want to grant the- islanders U.S. citizenship. Only Belau, perhaps the most important pawn on the American strategic chessboard, poses an obstacle. Its people have time and again rejected Washington's blandishments and have reaffirmed their support for the anti-nuclear provisions of the constitution. (See Anumukti Vol.2 No.l August '88)

> "Three years later the people of Kongelap were allowed to return to their island despite 'lingering.' radioactivity. Included in these returning to Rongelap were-200 people who had been away from the atoll during the "Bravo" and subsequent tests, an ideal 'control' population for the study of the long term effects of the lingering radiation on the islands". The controls' began showing signs of radiation induced diseases years later, after living on their radioactive islands and eating the radioactive food and water. The people who returned to Utirik, ".50 miles further away, began developing thyroid disease and cancers equal to the rates of the more heavily exposed Rongelap people twenty years later, giving evidence of the effects of even low-level radiation on human health. The 'guinea pigs' were indeed doing their jobs."
>
> The Nuclear Fix

Islands of Love

The southern part of the Pacific is French Polynesia; an area comprising of about 400 inhabited islands suffering the consequences of the nuclear ambition; of another Western "power". Known in Europe as. "Islands of Love", Polynesia have inspired dreams amongst many among them

Paul Gauguin, Herman Melville and Thor Reyerdahl.

This dream world was shattered in 1968, by the French decision to start nuclear testing on Moruroa and Fangataufa Atolls. The ruthlessness and the priorities of the French were demonstrated in the very first year itself. A test which was to be conducted in the august presence of President De Gaulle was not cancelled despite winds blowing towards populated areas. After all the French President was a busy man and could not be expected to change his busy schedule just because of an adverse wind!

France despite the Test-Ban-Treaty of 1963 continued atmospheric testing in the Pacific until 1975. These included a long series of unsuccessful attempts to discover the -nechanism by which hydrogen bombs are triggered off. After 1375 Moruroa has been subjeced to an unfinished series of underground blasts. These have damaged the geological structure of the island beyond repair. There are rumours that France is now looking for another site to continue its bomb testing programme. A site often mentioned its Kerguelen Islands in the Indian Ocean.

Powerful Links

France is the country with the most 'successful' nuclear programme. About 70% of its electricity, more than that of any other nation, is produced in nuclear power plants. However, in terms, of profits, the programme has beer, a dismal failure. The state run electri city "board" Electricite' du France- has a debt rivalling that of big Latin American debtor nations. The programme for increased nuclear power generation proceeds i*n* spite of all this. The strong links between the "peaceful" and the military uses of the atom are the 'motivating factor. Hiding this connection far away in the French colonial 'possessions on the other side of the globe is so effective that even the peace movement, in France does not show much.concern for the happenings- in Polynesia.

Other countries too, have used the Pacific for their war games. Britain conducted six atmospheric tests on Christmas Island in 1357 and 1958. At that time many people from Kiribati, today an independent republic, were present on the island to work on copra. As the British have refused to trace the people who were exposed to radiation, the government of Kiribati is now doing its own health surveys with very limited resources. Other British tests were conducted on aboriginal land in Australia, mostly in a sloppy manner.

Soviet military presence is limited to the northern Pacific, close to its own coast. However, the Pacific has been used for missile testing by both USSR as well as China.

"And I have had seven miscarriages and stillbirths. Altogether there are eight other women on the island who have given birth to babies that look like blobs of jelly. Some of these things we carry for eight months, nine months. There are no legs, no arms, no head, no nothing. Other children are born who will, never recognise their own parents. They dust lie there with crooked arms and legs and never speak. Already we have had seven such children. Sometimes I feel that I have a baby inside me. I feel very happy that. I will have a baby, but then I an afraid what kind of baby it is going to be. I live in two separate kinds of worlds: one. part of me I want to have a baby, but this other part of me is scared to have a baby.

We have asked ourselves a question. Why, why has this happened? Every year the US Depertment of Energy doctors would come to Rongelap to examine people. They would tell us that everything was OK - that we didn't have anything to worry about. We told them that we didn't feel any betterand that our bodies felt weak all the time. We believe that the sickness is caused by the radiation from the Bravo test."

Lijon Eknilang

Living Laboratories

During the last forty years, the right to life and physical welfare of the people of the Pacific has been frequently abused. They have wilfully been experimented upon. The fate of the victims of the "Bravo" explosion of 1954 on Rongelap, Utirir and nine other **islands** is the best known amongst the **examples** of such "experiments'. (See **Anumukti** Vol.2 No.l or better still see. the film "Half-Life")

Though they lived 300 kms. from the test site, they began to feel the effects of the contamination on the very day of the blast. They were evacuated days later to Kwajelein navy base where soon they lost their hair, their finger-nails ----- ' Three years later they were told to return to their contaminated home. A spokesman of the Brookhaven National Laboratory said, "... the levels of activity are higher than those **found** in other inhabited locations. The habitation of these people on the **island** will offer most valuable ecological radiation data on human **beings."** Hers, the world of SCIENCE had a laboratory the like of which Hitler's concentration camp doctors could only **dream of,** Much of what we know about the effects of radiation on human health has been the result of research done on unsuspecting Pacific islanders. Darlene Keja-Johnson from Ebeye Island testifies: "They check their throat for thyroids. They also check their urine and their blood. If a person is found to have a cancerous thyroid that needs to be removed, they are sent to either US or Hawaii or Guam. They don't explain to you what they are going to do to your throat. They just say that you are to go...only the Department of Energy! people. go and meet them, but they don't speak Marshallese. They are told not to make any phone calls to any relatives or friends. They are told to speak only to Department of Energy people."

"Now Japan is deciding to dump their nuclear waste into the Marianas Trench. That has made our islands so united that we are now much stronger. While some of us are still using kerosene lamps and candles, still fetching water from the well, in the US and Japan they have all the benefits of nuclear power. After all the nuclear bombs, now they are coming back with their nuclear waste.

Our only resources are the land and the ocean. We come to the ocean to relax. Our spirituality is the water, nature, the land, the stones. That's what keeps us alive today. We are a very simple people. Taking care of our families and our lands. Helping the poor. Helping the old people. We have no nursing homes for the aged - they are our books. They are our encyclopaedia. In our culture we have no written books. It is the old people who tell us our story, our tradition, from one generation to the next. They will be the ones teaching us to make rope, how to weave baskets. So, they are very important in our lives.

We are the people of the land and the ocean and we are struggling for survival. The ocean is our spirit. We come back, we sit down, we cry, we pray, we are still praying. Because our water is killing us, slowly."

Chailang Palacios

Growing Opposition

The success of the protest against French atmospheric testing in the seventies, has encouraged the people of the Pacific to continue their struggle against nuclear imperialism. The success was brought about by the cooperation of both non-governmental organisations like Greenpeace and the governments of countries like New Zealand, Peru and Fiji.The struggle promises to be both long and arduous. France meanwhile has, after switching to underground testing, taken to prosecuting the opposition in Polynesia and abroad. The criminal attack on the Greenpeace ship "Rainbow Warrior" in Aukland harbour in 1985 is just an example of this.

The independent nations of the Pacific, are trying to come to a unified position on nuclear testing and military

presence in the Pacific. U.S.A. has been engaged in trying to obstruct these efforts by exerting economic and military pressure. The Pentagon was "kinda delighted" that the coup made it again possible for U.S. nuclear ships to visit Fiji.

Ho **Compensation**

Nuclear blasts have made many an island uninhabitable for lakhs of years. The debris of the tests has either been thrown into lagoons or has been sealed into concrete domes. The first course recycles the waste into the food chain while the latter course just preserves the danger for future generations.

> "Since 1971 only four Western nations have used the sea for radioactive disposal. The trend is away from this dangerous practice in light of scientific evidence. When we went to Japan, scientists spoke to us saying that one drum of nuclear waste dropped in the ocean can kill 215,000 to 30,000 people. We are only 13,000 people. We are aware of the fact that Japan has relied on current international law and the London Dumping Convention (LDC), in which we have no say, to defend its plan to dump nuclear waste. To us the LDC is a mistaken idea. Island governments are given no protection and no participation in this convention."
>
> Maria Pangelinan

In 1977, the inhabitants of Rongelap and Utirik were offered a total sum of one million dollars as compensation. Compare this princely sum with the $13 nillion paid to the 24 crew members of a Japanese fishing vessel inadvertently caught in the danger zone of the same test. People of Bhopal would not be surprised by these American double standards!

The French government, as per previous contract, will not be liable to pay **any** compensation or reparations for the damage caused, when it eventually returns Moruroa and Fangataufa to 'the people of Polynesia

Nuclear Waste Bin

As if feeling that this nightmare should never end, several industrialised nations with Japan and U.S.A. in the frontline, plan to use the Pacific as a dump for the waste from their nuclear power plants.

In 1985 the London Dumping Convention, a UN body which sets voluntary guidelines for dumping toxic substances at sea, discussed the dumping of nuclear waste. Spain proposed an indefinite moratorium on nuclear dumping at sea. Activists of the Northern Marianas Committee Against Nuclear Waste Dumping had collected the signatures of nearly 100% of the population against nuclear dumping. Being a colony, they were officially represented by the greatest democracy USA, which opposed the Spanish proposal.

Recently, the issue has cropped up again with a new urgency. Yucca Mountain Nevada has been designated as the site for a high level waste repository. There is local opposition to choice of this site. In case tests prove the site to be unsuitable there is a good chance that Marshall Islands would be . selected instead. Some local politicians have already offered it for a little money in exchange.

Disposing nuclear waste in the Pacific has seemed more and more attractive as protests against disposal of wastes from nuclear power plants grow in the industrialised world. Ecological awareness in the West has thus unknowingly contributed towards a new, aspect of nuclear imperialism in the Pacific.

Source*:

* Thijs de la Court, et.al. The Nuclear. Fix :WISE (1982)

* Frances Connelly, et.al. Pacific **Paradise - Nuclear Nightmare :CND (1987)**

* Women Working for a Nuclear Free and Independent Pacific, Pacific Women Speak Green Line (1987)

* Union Pacifiste Nos.250 & 253 (1989)

* **WISE News Communique No.310 (1989)**

* Indian Express 12.6.1989.

Deadly Companions

Nuclear Race In South Asia

As a result of recent West German Investigations into a series of illegal exports of sensitive nuclear technology, evidence is mounting that Doth India and Pakistan have even mor e extensive nuclear weapons research, development, and production programs than previously thought.

Since the leaders of both the countries appear unwilling or unable to constrain their nuclear weapons programmes, these countries remain in a nuclear standoff. A military crisis might compel them to deploy nuclear arsenals, and risk a nuclear confrontation in South Asia. And if either country tests a nuclear explosive, thy other will undoubtedly follow, unleashing a race for more sophisticated nuclear weapons, including thermonuclear weapons.

Pakistan

Pakistan ranks third, after Israel and Egypt, in the receipt of U.S. foreign aid. In November 1988, as a prerequisite for congressional approval of $231 million of military aid and $350 million of economic aid, President Reagan certified that Pakistan does not possess a nuclear explosive device. The standard, according to the Reagan administration, is, "whether Pakistan possesses a nuclear explosive device, not whether Pakistan is attempting to develop or has developed various relevant capacities." But with his certification, the president attached a letter to the Speaker of the House, indicating that the certification was far from easy. And Pakistan's current status may make it impossible for George Bush to make the same certification in 1989. .

Despite an earlier promise to the Reagan administration not to enrich uranium abovo 5 percent,., Pakistan is **Widely** believed to have been producing weapon'-grade uranium enriched over 90 **percent)** at its enrichment plant in Kahuta since 1986. Pakistan' s current -annual product ion rate of weapon-gracle uranium is. ' estimated to be .20-75 kilograms of weapon-grade uranium a year. At this: rate, Pakistan- will have produced 125-175 kilograms of weapon-grade uranium through 1988 atnd about 175-325 kilograms by the end of 1993. Pakistan's weapon program can build nuclear weapons requiring less - perhaps significantly less - than 20 kilograms of weapon-grade uranium each. Although the actual amount required depends on the skill and knowledge of the designers, at 20 kilograms per weapon Pakistan would have accumulated enough material to build six to eight nuclear bombs by the end of 1383 . Through 1990, Pakistan could have enough for 8-16 weapons.

Unrestricted Plutonium

For several years, reports have circulated that Pakistan is interested in building a reactor that would produce unrestricted plutonium. West German government sources recently revealed that during the mid-1980s Pakistan tried to acquire reactor components and technology from West German firms. According to a March 6, 1983, report in **Nuclear Fuel,** U.S. officials told the West German foreign ministry in 1986 or 1907 that "it is well known that Pakistan is developing an indigenous, unsafeguarded reactor," and advised German export officials to stop a German firm from supplying Pakistan with boron carbide, a neutron-absorbing material used in reactors.

Nuclear Fuel also reported that confessions of key suspects in the German investigation of illegal exports of nuclear 'technology and components to Pakistan by the West German firm NTG Nukleartechnik GmbH indicate that this firm supplied Pakistan with "know-how for desing and construction" of a "small pool-type" reactor.

Any plutonium produced in an unsafeguarded reactor could be extracted from the irradiated fuel in Pakistan' s small, unsafeguarded reprocessing facility, New Labs, near Islamabad; This facility is reportedly capable of separating 10-20 kilograms of plutonium a year, but it is not known if the plant is operational or whether this annual capacity can be achieved.

Help from Chin

While Pakistan was developing the ability to produce the explosive materials, it was also learning how to design nuclear weapons. In 1984, Reagan administration officials asserted that Pakistan got design assistance from the People's Republic of China, although descriptions of the nature of this assistance *vary* greatly - from information about a crude nuclear device to a copy of the detailed design proven at China's fourth nuclear weapons test. According to Leonard Spector, the test involved the detonation of a warhead carried by a. missile, so if Pakistan received a copy of that design it has a warhead much smaller than a typical Chinese aerial bomb and able to operate under much more exacting conditions.

Whatever the nature of China's help, on its own Pakistan has tested the non-nuclear high-explosive triggering or implosion paclage for a nuclear weapon, according to Spector. Teste using a dummy core of natural or depleted uranium provide critical information about the imp Losion system. Pakistani scientists could evaluate the performance **0f** their design by using flash X-ray machines, which/take split-second photos of the warhead core during a test, or by using "pin-sensors" - electrical conducting pins placed within the core which measure the arrival times of the high-explosive shock wave. Because a spherically symmetrical explosion is required to compress the uranium in the core to supercritical mass, an accurate prediction of how the shock wave acts on the core would improve Pakistan's confidence that its design would perform as expected.

In an apparent attempt to build smaller nuclear weapons or to extend its existing stockpile of nuclear explosive materials, Pakistan has tried several times to import beryllium from West-Germany, and in a few cases succeeded. In 1987 Pakistan also tried unsuccessfully to obtain beryllium illegally from the United States.

* Both India and Pakistan have imported beryllium - a material useful in designing smaller, lighter, and more sophisticated nuclear weapons. India is also producing beryllium in its own facilities.

Beryllium is useful in the design of smaller, lighter, and more sophisticated nuclear weapons. The minimum amount of Plutonium or highly enriched uranium required to sustain a chain reaction, or "critical mass," can be reduced oy surrounding the core with a neutron, reflector, and beryllium is a particularly effective reflector.

Although a test might yield the political benefits of recognition as a nuclear power, Pakistan may be confident enough in its fission bomb design to feel that a full-scale nuclear test is not required. The design could be tested by conducting "aero-yield" tests, in which conventional explosives compress a small core of nuclear material, to produce a nuclear yield large enough to be monitored but still smaller than the blast from conventional explosives. If done carefully, zero-yield tests are virtually impossible to detect.

Tritium-booster

On January 29, 1989, the **New York Times** published the puzzling revelation that Pakistan had acquired a tritium purifying plant from West Germany to separate up to a few hundred grams of tritium "a year from other elements. According to **Nuclear Fuel's** reporter Mark Hibbs, the plant was shipped and assembled in stages between 1985 and 1987. About 0.8 gram of tritium was also sent along to test the plant's purification ability. Hibbs reported that the plant is located in a heavily guarded bunker at a military site about 150 kilometers south of Rawalpindi.

A few grams of. tritium, when mixed with roughly equal amounts of deuterium (readily available in such small quantities), placed inside a warhead can "boost" the yield of the fission explosion several fold, allowing significant reductions in the size and Wight of a r.uclear weapon. (Initial loadings of taitium are not needed in thermonuclear weapons, because deuterium, in the form of lithium deuteride, can be used instead.)

> * Pakistan has acquired sophisticated tritium processing equipment from West Germany, and India is building a plant that will be able to produce large amounts of tritium.

Since Pakistan is not known to have a large supply of impure tritium gas, the purification plant might have been intended as part of a complex of facilities dedicated to the production, extraction, and purification of tritium. Hibbs reported in February that Pakistan does not appear to have acquired the processing equipment necessary to separate tritium from the deuterium used as a coolant and moderator in its CANDU power reactor. According to him, it is possible that Pakistan might intend to produce tritium in an unsafeguarded reactor by irradiating lithium-6 targets. U.S. government officials say that Pakistan has tried to acquire lithium-6 and lithium production technology, although the outcome of its efforts is unknown.

Hibbs says that Pakistan intended to test its lithium target technology in the U.S.-supplied five-megawatt-thermal research reactor located in Rawalpindi by placing lithium rods inside neutron-absorbing control rods, which are inserted into the reactor to keep the nuclear reaction from going out of control. Although this reactor is inspected by the International Atomic Energy Agency, these inspections primarily monitor the highly enriched uranium fuel and are not designed to detect secret tritium production.

But even if it succeeds in obtaining tritium, Pakistan may not be able to develop tritium-boosted or thermonuclear weapons at the present time. _ Pakistan's acquisition of a tritium 'separation plant is difficult to understand, since its weapons program .is not thought to be sophisticated enough .o use this material now. Perhaps Pakistan is simply trying to mirror India's perceived capabilities, on-lead the world to worst-case speculation and the-impress ion that its weapon capabilities are more extensive than they are. "Bombs; seem bigger if they are ambiguous," says Theodore Taylor, who played a major role in developing boosted fission weapons. Alternatively, Pakistan might bo lookiig toward the future, and the tritium plant would be smother- indication that Islamabad is trying to improve its nuclear weapons capability in order to be ready to test more sophisticated devices, if it decides to start testing.

In Taylor's view, unless Pakistan has been given or was successful in. stealing a praven design, it is doubtful that Islamabad could develop reliable thermonuclear weapons or boosted fission weapons without conducting full- scale nuclear tests.

Delivering the Bombs

Pakistan has several aircraft capable of delivering nuclear weapons to Largest in India. Its most sophisticated aircraft are its 37 U.S.-supplied F-16 attack aircraft (It has been recently granted 60 more) and about 50 French-supplied Mirage-5 attack aircraft.

> * Pakistan is reported to have Perfected the design of nuclear aerial bomb for its U.S.-supplied F-16 attack aircraft, and India has apparently been working on the design of a nuclear aerial bomb since 1984.

In January 1989, there were reports that Pakistan now has an aerial fission bomb that can be carried beneath its U.S. -supplied F'-16 attack aircraft. This report also stated that the detonation mechnism has been perfected and the bomb casing is suitable for high-speed flight. Progress has been made on developing an in-flight fusing mechanism, to prevent detonation until after release from the aircraft. Pakistan has also reportedly shifted from- "rapid-detonation. high explosive to high-meIting-point explosive technology, which is widely used in U.S. nuclear weapons. This permits a reduction in the size of the warhead.

Pakistani army chief Gen.Mirza Beg announced in early February that Pakistan had successfully test-fired two short-range surface-to-surface missiles with ranges of 48 and 180 miles and with pay loads of about 500 kilograms each - large enough for a nuclear warhead. These missiles could be operational by the early 1990s.

India

No one disputes India's ability to build Pissicr: bombs. It detonated a 12-kiloton "peaceful" nuclear explosive in the Rajasthan desert in 1974. Although some reports have stated that India has actually built nuclear weapons, the Indian government consistently denies these reports and maintains that its official policy is not to build nuclear weapon..

Within a Few Weeks

In 1985 Prime Minister Rajiv Gandhi said repeatedly that India could acquire nuclear weapons at any time. In a **Le Monde** interview in June 1985 He said that India could become a nuclear power within a few weeks or months.

* India probably decided several years ago to acquire the know-how to make a thermonuclear weapon (hydrogen bomb) as a hedge against Pakistan's growing atomic ability, and to be prepared to test such a device within a few months of a Pakistani nuclear test.

* India probably decided several years ago so acquire the know-how to make a thermonuclear weapon (hydrogen bomb) as a hedge against Pakistan's! growing atomic ability, and to be prepared to test such a device within a few months of a Pakistani nuclear test.

On August 8, 1985, India achieved the ability to produce unrestricted weapon-grade ' plutonium when it commissioned the unsafeguarded 100-megawatt Dhruva reactor at the Bhabha Atomic Research Centre (BARC), a large establishment employing about 14,000 people. India has also operated the 40-megawatt Canadian-supplied Cirus reactor since the early 1960s, another reactor not subject to international safeguards, The plutonium from the Cirus reactor is. restricted to peaceful uses, which India claims include "peaceful".nuclear tests;

The Dhruva reactor operated sporadically for three years, finally reaching full power in early 1988. According to India's Department of Atomic Energy's annual report for 1987-88, the Trombay reprocessing facility at BARC has been reprocessing Dhurva's spent fuel. When operating at full power, this reactor produces about 25 kilograms of weapon-grade plutonium a year, or enough for at least five nuclear weapons.

Comparable to China's Arsenal

In late 1985 or early 1986, India's reprocessing facility began separating plutonium from fuel irradiated in the unsafeguarded and unrestricted Mairas Atomic Power Project. The amount of Madras fuel reprocessed and the grade of the plutonium extracted is unknown, although Spector reported that India had recovered enough plutonium from Madras fuel for one to four nuclear fission weapons by the summer of 1986. Since then, the reprocessing facility has apparently continued to reprocess; spent fuel from the Madras reactors.

In all, by the end of 1988, India was estimated to have about 200 -250 kilograms of unsafeguarded plutoniur - enough for at least 40-50 nuclear weapons. During the next few years, this stockpile could increase at the rate of roughly 75 kilograms of weapon-grade plutonium, or enough for more than 15 new weapons, each year. If unchecked, India could create a stockpile of nuclear weapons by 1995 that would be comparable in number to China's nuclear weapons arsenal.

There is little reason to .doubt India's ability to design nuclear warheads small enough to be carried on aircraft and possibly on the missiles it is now developing. These efforts may have been helped by the import of almost .100 kilograms of beryllium from West Germany: in 1984 •• a supply large enough for dozens of nuclear weapons. At about the same time, India commissioned Its Beryllium Pilot Plant at New Bombay, which has produced...at. least kilogram quantities of beryllium.

India produces tritium for a wide

range of civilian applications, including light sources. India's current source of tritium, however, is not explained in the annual reports, although it probably comes from irradiating lithium in the Dhruva or Cirus reactors. India is also setting up a chemical exchange cum cryogenic distillation pilot plant at BARC to remove tritium from contaminated deuterium used in its research and power reactors.

Thermonuclear Weapon

A May 1935 West German intelligence document cited an unconfirmed report that the "leadership of the Bhabha Atomic Research Centre had been given the assignment by the Indian Defense Department, after consultation with the Prime Minister, to continue working on the development of a thermonuclear weapon." Preparations were to be made so that "within two months of a Pakistani nuclear test, the second Indian test could be carried.out. Such an Indian test should simultaneously be used for the development of a fusion explosion." There is also indirect evidence of India's thermonuclear weapons programme. BARC has an extensive fusion energy research programme which could be of great help in designing thermonuclear weapons. In the mid-1980s, India's Department of Atomic Energy announced that it would develop an inertial confinement fusion process, using high-power lasers to implode tiny amounts of deuterium and tritium. According to the 1987-1988 annual report, one part of the lasers is nearing completion. Once finished, this laboratory-scale facility would provide India with a way to study high-energy density physics associated with a thermonuclear explosion, improve elaborate weapons design computer codes, and develop sophisticated diagnostic techniques and instrumentation.

Indian scientists have also sampled fallout from atmospheric nuclear weapons tests, a technique that may have provided India with useful data about both thermonuclear and sophisticated fission weapon designs. In 1980 Indian scientists sampled radioactive fallout from the twenty-fifth Chinese thermonuclear explosion "to obtain information on the test as well as on the levels of fallout at countrywide monitoring stations."

Missile Delivery

India has several aircraft capable of delivering nuclear weapons against both Pakistan and China. India's most sophisticated aircraft are Anglo-French Jaguars, Soviet MiG-23s and MiG-27s, and French Mirage 2000s. On October 3, 1968, **Defense and Foreign Affairs Weekly** reported that since 1984 India has been perfecting a. nuclear aerial bomb and techniques for its delivery on MiG23 and -27 aircraft.

* India has already successfully tested an intermediate-range ballistic missile with a range of 1500 miles; in February, Pakistan said it had test-fired two short-range missiles.

India has already successfully tested an intermediate-range ballistic missile with a range of 1500 miles; in February, Pakistan said it had test-fired two short-range missiles.

Although there is no public evidence that India has developed a nuclear warhead for missile delivery, India is developing ballistic missiles that are capable of carrying such payloads.

Choice

Pakistan and India can choose to aggravate or to prevent a weapons competition. Unless they constrain their nuclear weapons research and development programs, these programs could create institutional momentum within each country to build and test nuclear weapons. And if either country tests or deploys , the other is sure to follow, with dangerous consequences for the security of South Asia and the rest of the world.

A test or deployment of nuclear weapons could also cripple current efforts to stop other developing countries such as Argentina and Brazil from going 'nuclear' and perhaps even undermine the viability of the Non-Proliferation Treaty. Several nations may find it politically difficult to be considered inferior to Pakistan in nuclear matters.

* A ban on nuclear tests and a

verifiable nalt in the production of unsafeguarded plutonium and highly enriched uranium would not prohibit either country from possessing nuclear weapons but would significantly limit the size and sophistication of their nuclear arsenals. India's recent decision to join other signatories of the Partial Test Ban Treaty in calling for a conference to expand the treaty is a hopeful first step in the direction of obtaining a universal test ban.

But the main goal in the region should remain verifiable commitments not to build nuclear weapons.

Courtsey: David Albright & Tom Zamora
Bulletin of Atomic Scientists, June '09.

Tritium: Bad For Mice And Men

In December 1988, Canadian media reported what appeared to be the first identifiable health effects in citizens due to the release of radioactive material from the CANDU nuclear generating ■station at Pickering, Ontario. The news reports were based on a study performed by the Oshawa based citizens' group Durham Nuclear Awareness (DNA), which utilised published tritium release data an*d* mortality data. Like a number of health studies before it, health effects in citizens ' linked to industrial waste were first identified not by the medical community, industry or government health departments, but by concerned citizens.

At. Pickering it was the radioactive by-product tritium which was linked to increased newborn infant fatalities and certain types of birth defects. What is alarming is that it is routine and unavoidable emissions of "acceptable" levels of tritium which seems to have caused the health effects, and this suggests that, people living near CANDU plants throughout the world are at risk. All CANDU stations create and release enormous quantities of a highly toxic water form of tritium known as "tritiated water". Tritium is created when the large inventory of heavy water within the CANDU reactor captures neutrons. Tritiated water is chemically indistinguishable from water since tritium is an isotope of hydrogen. It is impossible to prevent the release of tritiated water without expensive and exotic isotope separation equipment. Except for the new Darlington nuclear station where such an experimental unit has been set up, all other CANDU stations are releasing tritium on a large scale.

> What is alarming is that it is routine and unavoidable emissions of "acceptable' levels of tritium which seems to have caused the health effects, and this suggests that people living near CANDU plants throughout the world are at risk.

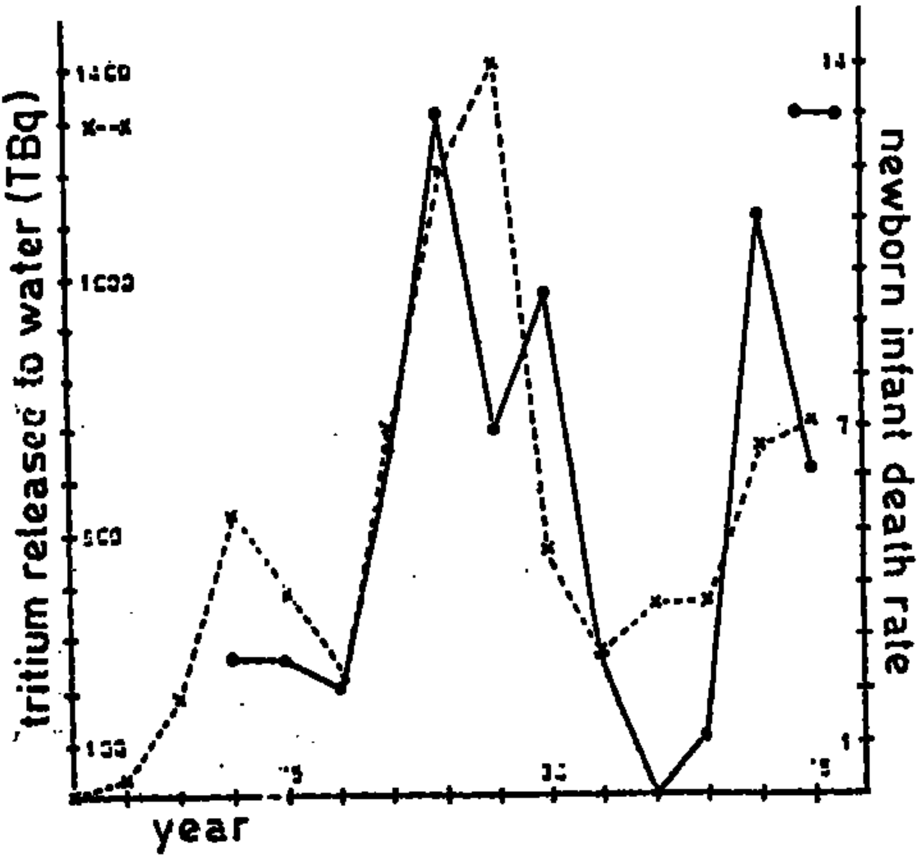
Much of the scientific community is convinced that the release of tritium is not pollution and its build-up near power stations is not a public health threat. The owner of the plant, Ontario Hydro is able to control the timing of its tritium releases and handles tritium releases to air quite differently from tritium releases to water. Tritium released to air disperses widely and does so quickly. Ontario Hydro also has the capability to ensure that some of the tritium it releases to air is done at a time when the winds are blowing offshore.

Tritium in water does not disperse as quickly or as widely as tritium released to air. Tritium releases to water cause water contamination at nearby water supply plants for months afterwards according to Ontario Hydro's own document SSD-IR-80-7.

Tritiated water readily accumulates in people via drinking water, inhalation and other routes. Tritium is doubly toxic; firsely due to its beta radiation arid secondly due to the fact that tritium decay results in breaking of hydrogen bunds and this plays havoc with biochemical reactions. Humorous studies with mice and other laboratory, animals have shown unequivocal evidence of birth defeats and high infant mortality when tritium is administered in trace amounts to pregnant females or male parents besfore conception. For this reason, children of male nuclear plant workers could be especially at risk due to tritium.

Incorrect Tritium Figures?

The Atomic Energy of Canada Board (AECB) has indicated that the tritium figures it had published in its own report (INFO-0210 in 1986 and in a revised version again in 1987 were incorrect. The AECB now says that the tritium released to water figures for 1978 and 1979 it had published for Pickering power • station must be lowered by a factor of ten. (Even with this reduction tritium releases to water at Pickering in. 1977,1978 and 1979 were still very high.) The errors in. the AECB report were not detected apparently, until after' the DMA report was released.



Examination of the new: data reveals that the possible link between tritium emission end increases in infant deaths and fatal birth defects is now even more .bvious. It is tritium releases to Water and not air which now seem to be strongly linked to newborn infant fatalities. The match of these two curves between 1974 and 1985.' is: particularly striking.

More Study Needed

Citizens must ask whether the Ontario government and Ontario Hydro, who have invested $30 billion to date in nuclear projects in Ontario, are free from a conflict of interest in commenting on the threat to human health from tritium. This question is especially relevant as the experimental evidense associating, tritium with health effects in laboratory animals only surfaced -after Canada made its commitment to CANDU heavy water reactors. (It is not Camadian research which found these problems.) Another question that arises is to what extent has military secrecy concerning nuclear weapons and tritium (tritium is an essential component of thermonuclear weapons) leal to secrecy concerning health effects of tritium?

What. is clearly needed is acknowledgement that there is a potential health problem concerning tritium in our environment. Adequate health and epidemiological studies need to be carried out. We also need a comprehersive tritium health effects research programme.

David MeArthur

Editor's Note: Last year too we had an article "The Perils of Tritium" by Nigel Harle (Anumukti Vol.1 No.6 June '88) on the tritium threat. Tritium is of special relevance to us in India since the mainstay of the Indian atomic energy programme are the very same CANDU reactors, which release large quantities of tritium. Official fondness for them has nowadays become so great that they are refered to as "our own PHWR design".

Medvedev Vindicated

Recently there were newsreports headlined "Soviets Throw Light on a 32-Year-Old Nuclear Mishap". They reported a serious nuclear accident in September 1957 near the town of Kasli in. southern Urals. The cause of the accident was the explosion of a tank filled with radioactive waste. It created a radioactive trail 105 kms long and 9 kms wide and required the urgent evacuation of 10,000 people. Even now, about 20% of the contaminated area is still not fit for habitation. The accident was never reported since it occured at a defense factory intended for building atomic weapons.

These matter of fact reports hide a spellbinding tale. it is the story of one man's perseverance in the face of scepticism and ridicule by the entireties tern nuclear establishment. Zhores Medvedev is a Russian geneticist. While on a visit to England in 1973, his passport was; cancelled by the Soviet authorities. He has since lived in England. In 1976, the British popular-science journal, **New Scientist** invited him to write,- an article on the role of scientists in Soviet society. His article entitled "Two Decades of Dissidence" dealt mainly with the harm done,. science by the ideas of Lysenko. In ••""''passing, it mentioned that, "one of the most important episodes which: brought a group of influential atomic physicists, together with the" persecuted geneticists was the nuclear disaster in the Urals." Medvedev at the time had no idea that Western experts as well as the media were uninformed about the. disaster. In the article Medvedev also stated the cause of the accident as an explosion in radioactive waste which had been stored underground for many years.

At the time there was a heated controversy in the British press. regarding nuclear waste. Medvedevs revelations sparked an immediate explosion. Nuclear experts immediately denied the story by claiming that it was "technically impossible". Most high handed was Sir John Hill, the the chairman of United Kingdom Atomic Energy-Authority. He called the article "rubbish" and dismissed it as "pure science fiction" and a "figment of the author's imagination". "This sort of waste has a very, very low activity and could not possibly give that sort of explosion, nuclear or thermal."

At this stage, CIA sources stepped in. Although an accident had in fact taken place, they claimed,"it involved a reactor that went out of control and had nothing to do with waste. Moreover, the reactor involved technology only distantly related to present day nuclear power plants and its relevance to the safety of nuclear power plants today is possibly minor."

A month later in December 1976, another Russian emigre scientist, Professor Tumerman, then living in Israel, confirmed Medvedev's account. In I960, while on road trip between Sverdlovsk and Cheliyabinsk he had seen road signs which warned drivers not to stop for the next 30 kms and drive at full speed. He also mentioned that by all accounts the accident had been caused by careless storage of radioactive waste

Despite this eyewitness account, nucleocrats remained sceptical. Sir John Hill reasserted, "even allowing the emote possibility of such an accident he probability that it could possibly ave had the kind of consequences .'escribed is even more improbable."

Medvedev's answer to this challenge - his credibility was a book - a feat of extraordinary research and analysis. Published in 1979, **Nuclear Disaster** ***in* the Urals** critically examines a large body of Russian published work in fields such as radiobiology, radioecology and genetics. Studies of intake of various radionuclides and their propagation 'Through different food chains routinely •mention the size and location of the area where the study is conducted as also the 'siming, the composition and the quantities of radionuclides introduced for the purposes of the study; a full .accounting of **the** radionuclides distribution and the amounts left after the experiment's conclusion. Medvedev found that a very large number of Russian **papers** published during the sixties just om**itted** all such procedural details. Despite the omissions and in some cases, deliberate falsafications, he was able to glean the truth since the departures **from** normal experimental practice were so striking. For example, he showed that the contaminated area was not a small experimental plot as the papers seemed to imply, but an area at least hundreds, of square kms in extent by looking at the numbers of different kinds of birds fishes, mammals, trees, acquatic plants micro-organisms, etc. that had been studied by different researchers.

Nuclear Disaster in the Urals is a book which ought to be read by all - especially students of science not only for the facts it describes are-interesting and important in their own **right.,** but also as an illustration of the scientific method in practice. It **reads** like detective fiction. Clues are marshal led one after the other, till the conclusion seems unescapable. After its publication, no one, not even Sir John Hill could deny the fact of-the accident or that its cause had been the careless storage of radioactive waste.

After the book's publication groups in U.S.' tried to "find out the extent of CIA's knowledge regarding the disaster by use of the Freedom of Information Act. The CIA did have a very good knowledge of what had happened. They had not broadcast it however, because they did not want to jeopardise the emerging US civilian nuclear programme.

Why did the Russians decide to inform the world now after having kept quite for so long? They want to build a new nuclear plant in the region. This has raised a furious controversy. Officials claim that the plant would 'utilize' water still" contaminated from the previous disaster.

◆ ◆

Lost at Sea

A new study released by Greenpeace, reveals that 50 nuclear weapons and 9 nuclear reactors were lost or dumped at sea during the post war period.

Naval Accidents of 1945 - 1988 by William Arkin and Joshua Handler documents over 2000 major accidents including the sinking of 75 vessels, five of which were nuclear powered, with the total loss of about 2,800 lives. Of the 1,276 officially recorded accidents covered in the report, 377 occured while the vessels were in port. A majority of out-of-port accidents (624) took place **in** the Atlantic, 318 in the Pacific, 110 in the Mediterranean and 34 in the Indian Ocean.

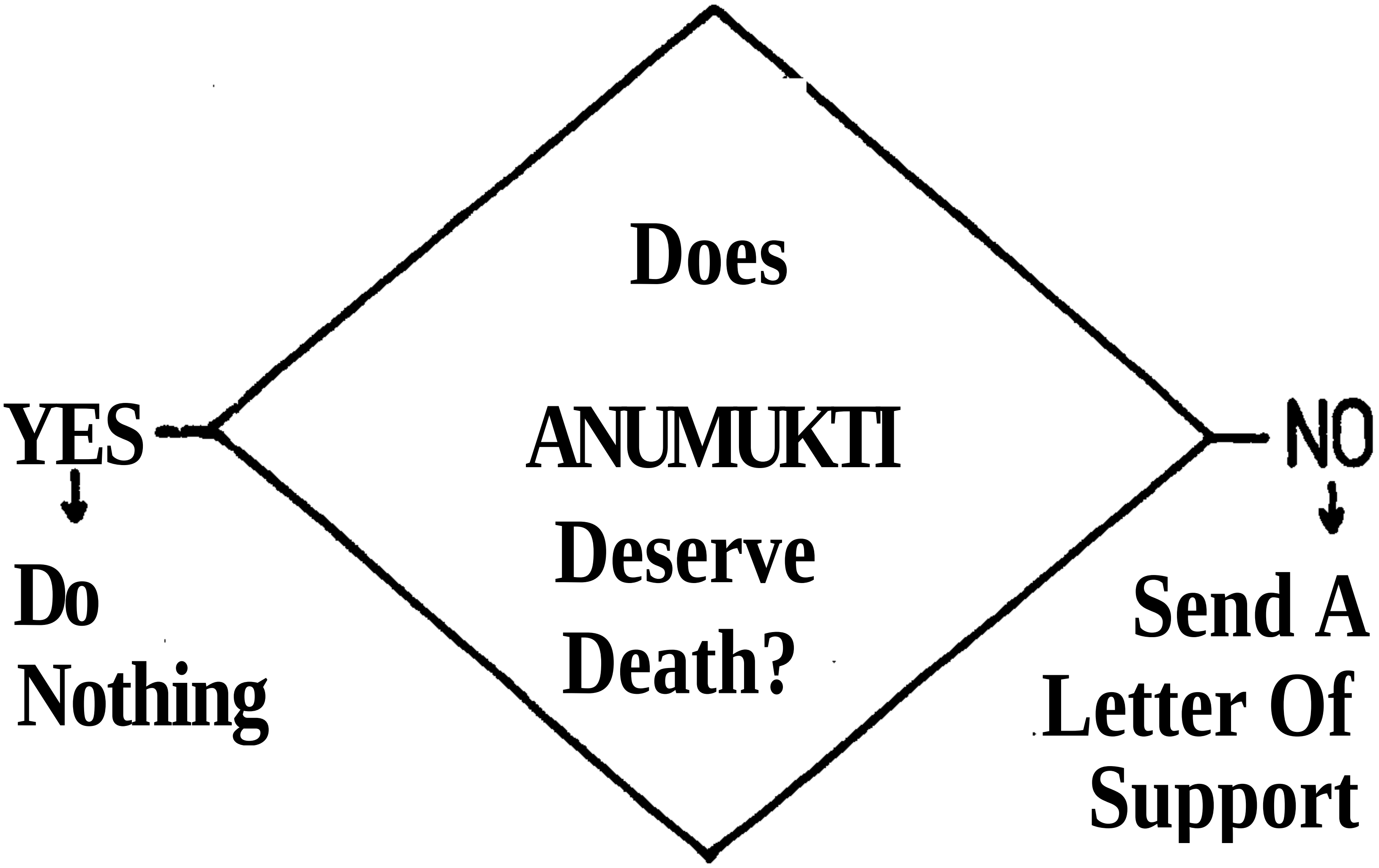
The most frequent causes of naval accidents were collisions, fires, **groundings** and explosions. Twenty seven submarines were lost at sea, of which **four** were USA, five Soviet and three British. Submarines belonging to Israel, Pakistan, Peru, Spain, Turkey and the FRG have also perished.

Launching the Greenpeace report at **a** press-conference, co-author Arkin said that although naval accidents would always be with us, the disasters .are far more dangerous when the vessels involved are nuclear powered. Arkin also mentioned that the authors had been unable to amass all the information on nuclear disasters due to the secrecy surrounding the subject in all countries. However, while preparing the report, Greenpeace for the first time had access to information about three major nuclear accidents on US naval ships, which till then had been suppressed. These were the loss of a hydrogen bomb from the aircraft carrier **Ticonderoga** off the Japanese coast in 1965, the fire aboard the **Belknap** in 1975 which broke out just twelve metres away from its nuclear weapon's **bay** and the leakage of radioactive water from the-reactor of the submarine **Guardfish** in 1973.

At present, there is growing concern about a spate of accidents on Soviet nuclear powered submarines in the last few months off the coast of Norway. Three serious accidents have taken place since April 6th, when a Mike-class submarine sank following a fire. 42 members of the crew died in that accident. Two nuclear reactors containing hundreds of kilogrammes of nuclear fuel and plutonium

from the sub's two nuclear torpedoes are **on** the ocean floor buffeted by the strong currents of the northern seas. **The** Soviets have promised to salvage the wreck. Unless they manage to do it in time, these dangerous toxins would be released to the marine environment sooner or later regardless of the condition of the submarines hull or the nuclear reactors today.

Source: Peace Courier June '89



Subscription Bates:

Rs.25/-per year South Asia
U.S.$ 15/-per year air mail overseas
(Rs.200/-per year if paid for in India)
Please add Rs.6 for cheques

Editor: Surendra Gadekar

Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

Editor Anumukti
Sanpoorna Kranti Vidyalaya
Vedchhi, Dist:Surat, 394641 INDIA

Published by S.Gadekar for Sanpoorna Kranti Vidyalaya and printed by him at The Progressive Printing Press, Surat.

(Along with your **subscriptions)**

Anumukti a year ago had 556 subscibers. This year there are only 375 and just 18 have renewed for the next year starting from August. Obviously something is very wrong. Maybe j it is the fact that we have not been able to stick to the scheduled publication date. Or, maybe Anumukti is no longer interesting enough - become too technical, lacks human interest stories, has a poor get - up —

In any case, if you want Anumukti to survive, please let us know of the fact and suggest the kind of changes you would like to see. Without sustainance from you, in the form of interaction Anumukti cannot live.

PRIMED MATTER BOOK POST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Volume 2 number 6 **June 1989**

BARC AND BYTE

Sone representatives of voluntary organisations in Bombay had submitted a memorandun to Dr.M.R.Srinivasan, chairman, Atonic Energy Commission, on Hiroshima day last year. The memorandun disoussed issues arising out of environmental hazards of nuclear power plants; the large number of accidents that have already taken place in nuclear industry worldwide; the grave threat posed by radiation not only to the present but also to future generations, the people who had been displaced out of their ancestral lands and finally the eoonomic unviability of nuclear energy.

They requested the government:

1. "To stop setting up nuclear power stations till a national debate covering all aspects of the use of nuclear power is held."
2. "To scrap Section 18 of the Atonic Energy Act of 1982 so that infomation regarding nuclear power plants, instead of being kept a closely guaarded secret is given to the public, consistent with the inherent right to information which has to be guaranteed to every citizen in a democracy."
3. "Not to dub those who raise doubts about nuclear power as traitors or foreign agents."

The reply to this memorandun has been penned by Shri Vittal. He is presently Additional Secretary, Department of Atomio Energy (DAG). We are reproducing his reply in full, just to give an exanple of the kind of infornation one gets from DAE in this enlightened ara of openness. I an inserting comments within the body of the letter to provide readers with a contrast to this official view. I an thankful for a number of these comments to Shri Sanjay Havanur, a Bangalore activist who sent a detailed reply to Shri Vittal. It is for the readers to judge what to make of the much touted spirit of Glasnost in the DAB.

The Letter

DO Ho 17/43/88-PD September 8, 1988

This has reference to the memorandun presented on behalf of the

Bombay Sarvodaya Mandal. While I appreciate the interest you and other organisations have shown in our activities, I find that the memorandum contains a number of statements which are not factual or scientifically correct. Before I come to answering the points raised in your memorandum, I wish to present the following facts for your information:

Contrary to what is stated in the memorandum, Nuclear Power Plants (NPP) have been proved to be benign to the environment and do not cause any ecological imabalance. One of the important components of the environmental protection policy adopted by the DAE is that DAB operations shall not disturb the ecology of the nature in whatever manner detrimental to the ecosystem. A constant watch is being maintained through the environmental survey laboratories located at each site. These laboratories provide surveillance around the facility up to 30 kms. distance.

Comment

Almost a quarter million Soviets are living on land so contaminated by the Chernobyl accident that they must receive special food supplies to avoid overexposure to radiation, says Pravada. The Communist party daily printed maps showing contaminated areas of Byelorussia, the Ukraine and the Russian republics, in response to the readers' complaints that they did not have full information even three years after the accident. The area where the current level of radiation from the environment and food supplies would expose residents to a lifetime (reproductive - 30years) dose of more than 35 rems, comprises more than 10,000 square Kms. It includes 640 settlements with 230,000 people. (Tines of India 22.3.'89)

The International Council for Radiologioal Protection (ICRP) presently recommends an average dose for a member of the . general public of not more than 5 rems per 30 years. Even this has been criticised as being too high and the ICRP is in the process of reducing this limit further. For the Soviet Union to tolerate limits seven times higher just shows their helplessness in face of the severity of the contamination. Even with limits so relaxed, an area as large as 10,000 square Kilometres has to be essentially 'written off. To call a technology capable of producing such havoc as "benign to the environment" is benighted to say the very least.

In the Indian oontext there is only one agency which sets up nuclear establishments, decides how their pollution is to be measured, carries out the actual measurements, interprets the results, evaluates it own performance and finally pats itself on the back for its 'cleanliness'. In the absense of any public acoountability and independent critical evaluations, DAE's contenions are untenable.

Letter

It is also wrong to say that trees have been felled at various locations where NPP are oproposed to be set up. On the other hand DAB has been spending money to develop the green belt around our installations. In fact, today, clearances from the Department of Environment and Forestry are a must before starting any new project.

Comment

The objection to felling of trees is made with special reference to Kaiga Nuclear Power plant. Raiga is located in the midst of one of the few remaining bits of tropical rain forests left in the country. Experience all over the world has taught us that the rainforest is a very fragile ecosystem and assaults on it in the form of human intervention are likely to destroy all of it. Harping on the green-belt 'created' by the DAE is to miss the woods for the trees.

Letter

It is not clear how you have concluded that 4,000 accidents have taken place in NPP's around the world including 300 in India. It is not also clear how these accidents have caused great danger to the present and future generations. I would like to point out that nuclear power has been in use for more than four decades and today there are 400 operating reactors in 26 countries producing 300,000 MWs of electricity which forms 16% of the world's total electrical installed capacity. Four major accidents have taken place since the beginning of nuclear power generation four decades ago. These are:

(i) Windscale accident in the UK in 1957
<ii) SL-1 accident in the U.S. in 1961
(iii) TMI-2 accident in. U.S. in 1979
(iv) Chernobyl-4 accident in U.S.S.R. in 1966

Comment

The word needs to be spread around our nuclear establishments that the incident at Three Mile Island should be treated as a 'major accident'. Dr.P.K.Iyengar, Director of the Bhabha Atomic Research Centre (BARC),speaking at the Bangalore Science Forum in September '88 had informed the public that TMI - 2 was not an accident at all, because, you see, "no one died there!" Dr.Raja Ramanna, former chairman of the Atomic Energy Commission (AEC) also needs to be informed that Chernobyl needs to treated as a 'major' nuclear accident. He is under the impression that Chernobyl was not a nuclear accident at all, but a "curious fire accident". (Bulletin of Sciences, a publication of Indian Institute of Science, Bangalore, August/September '88)

The figure of 4000 accidents in NPP's around the world is, in fact, . a very conservative estimate. Every year several thousand 'unusual occurences' are reported to the Nuclear Regulatory Commission (NRC) in the U.S.A. alone. In the four year period from 1980 to 1983, 744 events were considered particularly 'serious' by the NRC. Contrast this with the the system in India where unusual occurences, accidents number of forced SCRAMS, their reports, in short everything is kept safely away from public scrutiny.

Major nuclear accidents need not always be sharply defined single events.The military plant at Hanford, USA or our own thorium processing plan at Alwaye in Kerala have been continuously polluting the water sources for years. Radiation effects on living tissues are cumulative. The damage to public health and to the future generations will be done whether the radioactive pollutants are released into the environment in a single shot or distributed over decades.

Any list of major nuclear accidents which does not include the disaster near Ryshtym in the Soviet Urals in 1957 can not be called complete. Even official Soviet media have admitted to the occurence of this disaster which severly contaminated an area of 300 square miles and required the evacuation of 10,000 people. More than 30 years after the event lakes in the region are still contaminated.

Latter

In the Windscale and TMI-2 accidents there were no fatalities. In the other two accidents the fatalities were only those who were working in the plants. Ho neither of the public has ever died in a nuclear accident. I must also point out that with our present knowledge there has been no evidence of genetic abnormalities due to radiation seen in the human population. This conclusion is based on extensive studies on human populations including the Hiroshima and Magasaaki victims.

Comment

It is absolutely shooking to find statements like "No member of the public has died in a nuclear accident " still being made by responsible members of the atomic energy establishment. It is a display of the total lack of sensitivity towards the pain and suffering of the victims of nuclear industry. It is similar to tobacco industry apologists claiming that nobody has ever died of cigarette smoking since anybody who dies does so from heart attacks, respiratory failure, lung cancer etc. Deceitful statements like these are probably responsible for the very low credibiliy of nucleocrats.

It is universally accepted that radiation does cause genetio damage. The major evidence for this has come from animal studies especially on nice. The apparently reassuring absence of genetio damage in Hiroshima - Nagasaki studies needs to be viewed with caution. It is possible that an increase in severe mutations leading to miscarriage was masked by the high natural spontaneous miscarriage rate. Also, those mutations not leading to an early death of foetus would be likely to be recessive in charactor, that is abnormalities may not become apparent for several generations."

Radiation and Health: Dr.H.Dace

Letter

In the DAE, safety of NPPs is under constant review with a view to improving the safety status further with new developments. Following the TMI-2 accident a comprehensive review was conducted. after the Chernobyl accident we have made yet another review of the safety status of our plants.

It was concluded that our PHWR design has inherent safety features much better than other type of reactors.

Comment

To call the CANDU design as 'our PHWR design is something of a plagiarism. However, India is presently in the process of becomming the proving ground of various kinds of reactor designs from BWR (Tarapur) to CANDUs (Rawatbhata, Kalpakkam, Narora...) to Russian VVERs (Koodankulam) to French PWRs (?) Bach reactor design has different safety features and hence accidents in a partioular type don't contribute much to the understanding in a different type, except the crucial observation that catastrophio accidents result when the design faults are accentuated by operator failings. Thus statements like, "Our reactor designs have inherent safety features much better than other types" are irrelevent. None of the reactor types operating anywhere in the world or under construction presently are 'operator proof. Bach have different safety hasards. We have already disoussed the safety features andd the hasards of the CANDU design in the very

first issue of Anumukti.

Letter

We know that exposure to ionising radiation does involve a small risk of cancer. There are many other chemicals, particles and agents in the environment which also cause cancers. It is only in the case of ionizing radiation that a systematic study has been carried out right from the beginning. This in depth study has not been undertaken in any other industry.(e.g. Chemical Industry) It is this knowledge which has helped us to achieve a defence-in-depth philosophy of safety in all nuclear installations. As I mentioned earlier genetic effects have not been seen in the human population; these are however, included in our risk assessment as a measure of abundant caution. I must point out that there is no human activity which is totally free from an element of risk. Because of Several beneficial effects of radiation, it is perhaps worthwhile for all of us to take a very small risk. It is this philosophy that has pervaded our safety practices.

Comment

Workers, military personnel and the general public have been given the impression that exposure to radiation involves a slight risk of cancer and that one's chances of escaping this are better than the chances of escaping an automobile accident. The probabilities of early occurence of heart disease, diabetes mellitus, arthritis, asthma or severe allergies - all resulting in a prolonged state of ill health - are never mentioned. Most people are unaware of the fact that ionising radiation can cause spontaneous abortions, still births, infant deaths, asthmas, severe allergies, depresed immune systems (with grater risks of bacterial and viral infections) leukeamia, solid tumours, birth defects or mental and physical retardation in children.

(Ho Immediate Danger: Dr.R.Bertell)

It is perhaps worthwhile for all of us to take a very small risk." Perhaps Mr.Vittal, but who decides? You or the villager involuntarily living near a nuclear installation. The crux of the matter is that this 'small risk' is not shared equally by all.

Letter

It is incorrect to say that thousands of people have been uprooted at nuclear power station sites. Statisics show that the land needs for an NPP is only 0.3X to 0.4X of that needed for a hydel project. Even coal based power stations need more land than NPPs. The number of people displaced in an NPP project is also very small.

Comment

The statistics that an NPP takes only 0.3% to 0.4% of the land that is needed for a hydel project leaves me thoroughly confused. Official DAE documents claim an exclusion zone of 5 kms around an NPP for safety reasons. By elementary mensuration, this works out to be nearly 7,850 hectares. In case of Kaiga this is more than 1100X of the land submerged in the reservoir of the 240 MW Sharavati Tail Race hydel project also being undertaken in the North Canara district.

Letter

A detailed analysis of the thermal and nuclear power costs by an expert committee consisting of representatives of various departments of the Government of India as well as representatives from the private sector has clearly shown that nuclear power is cheaper than thermal power taking into account the transport of coal from the mines to the power station site as is being done at present. Further, in the nineties nuclear power will be competative with thermal power even at the pit heads, Incidently I must mention that Tarapur Atomic Power Station has not been decommisioned and still it is supplying 320 MW of power to Maharashtra and Gujarat. Today, Tarapur power is the cheapest non-hydel power.

Comment

Installation costs . of nuclear power plants have skyrocketed everywhere. As an example, even the official figures reveal that the Narora reactor has cost around a hundred times more than the Tarapur reactors. Similarly, operating costs too have'gone through the roof. This is due to the fact that many new safety features have had to be added-on following nuclear disasters elsewhere. Thus it is not clear to me that how this 'high' powered committee came to the conclusion that "During the nineties nuclear power will be competetive with coal even at the pit heads." Is it a reflection on the incompetence of the coal based thermal power people? Or, is it that in the interest of 'cheap' nuclear power safety considerations have been given the back seat? If in fact, operating costs are becoming less in India while they are shooting up in the rest of the world, this fact ought to be publicised far more. We can export this 'knowhow' to other countries specially to the so-called industrially advanced nations who are not so 'smart'.

We are aware of the costing exercise conducted by the expert committee which concluded that nuclear power is only marginally cheaper than coal far away from the pit heads. We are also aware of the following:

(i) The cost of decommissioning NPPs and of waste storage is not accounted for. Decommissioning costs are presently estimated to be at least 50% to 100% of the construction costs, but in our budget they are shown as being less than 1%.

(ii) The Comptroller and Auditor General's office has pointed out that the heavy water costs have been manipulated to an extent that less than 30% of the true cost is reflected in the accounting,

(iii) During the National Workshop on Nuclear Energy, Dr.A.K.N.Reddy had shown the several juggleries carried out with interest rates so that lower costs could be presented.

Letter

It is not true that the U.S. has either stopped commisioning of new nuclear power plants, or phasing them out. In the Unied States as of December 1987, there were 106 reactors producing 93,000 MW and four units under construcion with a 'capacity of 2,500 MWs. In the USSR, 56 reactors are operating with 33,600 MW and 28 reactors are under construction with a capacity of 28,000 MW. In fact, after Chernobyl, USSR has developed an improved version of the RBMK reactor. Only Austria has decided not to operate a nuclear power plant after completing construction. Given the small population and adequate resources it could afford to take such a step. It could also obtain gas or elecricity from neighbouring countries.

Consent

The article, "Beneath the Veneer of Progress - a Sick Industry** in the last issue (Vol2.No.2,3) of Anumukti documents in detail the sorry state of nuclear industry in other countries. It is in fact this terminal illness of the nuclear industry in its home markets which has lead to the spate of irresistable offers to third world countries such as India. The illustrative though not exhaustive list would have become more illuminating if it had included mention of countries such as Yugoslavia, where a law has been passed banning any further nuclear construction or Italy where 80% of the people have rejected nuclear power in a referendum. The list could have also gained from a mention of countries such as Sweden, Denmark, Finland, Greece and Philippines who have all been rethinking their commitment to nuclear programmes.

Letter

Taking into account the above facts which are not exhaustive but only illustrative, it is clear that there are many inaccuracies and mistaken notions in your memorandum based on wrong information and that this wrong information is apparently responsible for your three demands. The position regarding these demands is as follows:

1.Stop setting Up Atomic. Power Stations at. least till a National Debate. is. held;.

Starting with the commisioning of the first atomic power station in 1969 at Tarapur, nuclear power plants have been operating for 20 years. Our safety records in respect of safety of operating personnel the public and the environment have been excellent. All aspects of atomic energy including safety and economic aspects have been described in open documents. Being a Government organisation, the DAB is subject to review by the parliament commitees as well as Members of Parliament. In every parliamentary session, a large number • of questions covering all aspects of atomic energy are being answered over the years. In my view, this itself forms a major debate through the democratic channel, and therefore, I do not see any reason to stop setting up power stations and thereby denying much needed electrical power for the development projects in the industrial as well as the agricultural sector.

Comment

What are isssued in each session of parliament are self-congratulatory platitudes by the ABC. Most of our MPs are ignorant of the true hazards of nuclear power and the lack of environmental ethics involved in its generation. To call what transpires in the parliament as a "major debate" is a travesty. And, as per the 1962 Atomic Energy Act, the DAB is not even answerable to the parliament.

The only true debate on the NPPs was the one sponsored by the opposition ruled government of Karnataka. A debate where the nuclear establishment was thoroughly exposed, out a sorry figure, and where you, Mr.Vittal made the remarkable statement that "the era of secrecy has ended in the ABC." If your letter is any indication of the future the era of disinformation is just beginning.

Letter

2. To *Scrap* Section l8 of *the* Atomic Energy Act:

There is no need to scrap Sec.18 of the Atomic Energy Act as it is required in the interest of national security. As mentioned above all relavent information is being provided to the public through the answers to the questions raised in parliament.

Comment

What Section 18 of the Atomic Energy Act protects is not national security but the fact that nuclear power has been as colossal a failure in India as elsewhere. What is denied by this act is public accountability

Letter

3. No dubbing of those, raising doubts about nuclear:
To my knowledge no such dubbing has ever been done.

I hope that the above facts, clarifications and answers would be of some use to you to get a clear picture and appreciate the important contributions of nuclear power to meet the ever increasing demand of electricity in the country.

Comment

Antinuclear activists have been dubbed unpatriotic by none other than Dr.Raja Ramanna, the former chairman of the ABC. The harassment of nuclear critics has been going on for a very long time. The case of Dr.Dhirendra Sharma is an illustrative example.

I personally welcome Mr.Vittal's statement that no dubbing has ever been done, as an expression not of past practice but of future intention. It is the first prerequisite which all of us must adhere to in order to raise the level of the nuclear debate.

Anunukti needs your support and subscriptions

CALCUTTA CONVENTION ON NUCLEAR POWER

A convention on 'Nuclear Power and its Acceptability' was held in Calcutta on 30th of April,'89. The day long meet was attended by about 250 people. Amongst the audience were many distinguished academics, civil servants, artists and theatre personalities, engineers, doctors and social activists. The atomic energy establishment sent three representatives. They were Dr.A.K.De, the chairman of the Atomic Energy Regulatory Board; Dr.Bikash Sinha, the chairman of the Variable Energy Cyclotron project and Dr.L.Krishnan from the reactor safety unit at Kalpakkam. As has by now become commonplace these worthies were comprehensivly outdebated by the antinuclear spokespersons who included Dr.Dhirendra Sharma of JNU, Dr.S.Jana from the Institute of Public Health, Dr.S.Basu of Jadhavpur University and Dr.S.Gadekar of Anumukti. Many issues, particularly those of social justice and public accountability of nuclear power were well articulated in the inaugeral session by Dr.Sujit Das, Shri Amlan Dutta and Shri Ashok Mitra. During the afternoon session, many common problems enCountered by activists were discussed. The convention, the first of its kind in the eastern regions of the country, was the result of untiring efforts by many volunteers. Particular mention must be made of Shri Pradeep Dutta and Dr.Sujit Das.

SHADOWS OVER SRILANKA

As little as a year ago, Sri Lankan intellectuals used to shrug their shoulders when the nuclear issue was raised - "of what concern is it to us? Kalpakkam is hundreds of miles away." But after the signing of the agreement to import two Russian built reactors by India, the situation has begun to change here as well. The prospect of having two large nuclear reactors at Koodankulam just off Sri Lanka's coast is disturbing.

The Shadow Region

On February 1st, 1989, inspite of the ongoing civll war and the heotic election campaigns, some people got alert when the large daily The Island published ,an article about Sri Lanka's radiating future and commented on it editorially. The paper was alarmed especially by a statement that "Koodankulam lies in the shadow region of Sri Lanka", made by the project director V.S.G.Rao in a seminar at Madras University and carried by The Hindu on January 29th 1989. Rao also said that cyolones would not affect the plant and that seismic studies show that it's rooky foundations are safe.

The Sri Lankans are mainly concerned about the safety of the reactors. Since Indian nuclear technologists have had no previous experience of operating plant of this type and of such large size, they tend to disbelieve their assurances regarding safety.

But they.. are also conoerned about other issues. Besides environmental concerns' and questions about waste disposal, they are especially suspicious of India's claim that the nuclear programme serves an entirely peaceful purpose: they see it in the context of the development of India's 'Agni' missiles of intermediate range. Sadly but truly, public opinion in Sri Lanka does not see India as a peaoe loving neighbour.

IAEA Inspection Demanded

The Sri .Lankan demand to ask for an IAEA (International Atomic Energy Agency) inspection of the plants , though understandable in this perspective, is nevertheless, strange. IAEA's own involvement in the promotion of nuclear industry is well known and should not be overlooked.

Sri Lanka joined the IAEA in the 1950's and on its recommendation formed its own national Atomic Energy Authority (AEA) in 1969. Since then, IAEA has helped Sri Lanka in the establishment of several "beneficial' products of nuclear industry like the nuclear imaging centre at the Colombo hospital. Besides medical research, it has also helped in spreading nuclear techniques in the fields of archeology, food preservation and in various branches of industry.

AEA chairman Dr.Granville Dharmawardhane sees IAEA's role as a much needed corrective in international nuclear affairs. Nuclear energy, according to his , may reduce or widen the gap between rioh and poor countries. As industrialised countries tend not to share their knowledge in this field with other countries in order to protect their own economic interests, and as the developing countries absorb new technologies only slowly, the IAEA cones into help. It was only due to IAEA assistance, he says for example, that the Radio Isotope Centre at Colombo University was established.

The Man **Who Needs Watching**

But Dr.Dharmawardhane's aims go far beyond the use of nuclear techniques in industrial investigations or medical research. That is only the first step, to be followed by the creation of a nuclear research facility and reaching its ultimate objective in the use of nuclear power reactors. The fuel for fulfilling his dreams, he hopes to obtain from seawater. (Nuclear News.Bulletin of AEA, July '81; Daily News 26.3.'85 and 24.12.'88).

Very euphoric portraits of Dr.Dharmawarahane already started appearing in Sri Lankan papers as early as 1980. In one he was described as " the man who is to be watched, for nuclear applications are dawning on us with a big bang! "(Daily News 26.11. 80)

Plans shelved

While nuclear power generation was not considered feasible in Sri Lanka in the early 1960s, the issue cropped up again in 1980. That year President J.R.Jayewardene appointed a committee of experts to report to his regarding the feasibility of nuclear power generation in the country. The recommendations of these scientists not to build a nuclear power plant this century and public protests influenced him to shelve the idea.

Dr. Dharmawardhane is however, not sitting idle. His own group of experts recommended in an 82-page report the construction of a nuclear power reactor in Sri Lanka by the early 1990s.(Sunl0.1.'81) While the island republic was struggling with other problems, interested circles have never remained totally silent about their plans to press for a nuclear future.

Among them is Hr.Aelred Fernando, Director, Energy Planning in **the** Ministry of Power and Energy, a man who had part of his education with the help of the IAEA. Mr.Fernando hopes to create a core group of scientists who by the year 1994 could undertake a new feasibility study for the establishment of a nuclear power plant going critical by the year 2004 AD (Daily. News.12.9.'86)

Creating a Lobby

At Moratuwa University near Colombo, a large number of electrical, electronics and mechanical engineering students have already specialised in nuclear engineering. Between 1983 and 1985, the output was estimated to be about 100 trainees.(Sun. 22.2.'85) Although these people are supposed to find employment in existing institutions where nuclear techniques are alredy in use, "one cannot escape the feeling that this could well be the lobby that would clamour for nuclear power," as Mallika Wanigasundara remarks.(Daily News 12.9.'86)

The Indian army sponsored Provincial Council government in **the** north and east of the island in the beginning of this year also decided to investigate into the possibilities of building a nuclear power plant in this area of its influence. The government is under pressure from environmentalists protesting against the building of a thermal power plant near Trincomalee. A nuclear plant would also **make** the north and east more independent of the hydroelectrio power now produced mainly in the central province.

On the same day that Sri Lanka discovered the "Nuclear Danger from Tamilnadu"(The Island 1.2.'89), a whole page advertisemnt appeared in the same paper, describing the new Siemens 'gamma camera' installed at the Nuclear Imaging Unit of the Colombo General Hospital. Whether ultimately Sri Lanka does or does not 'go' nuclear, it is already a ready market for the 'beneficial 'byproducts of the nuclear industry.

"Proteot Waters, Protect Life March

On May 1st, the Kanyakumari police sprayed bullets on the demonstration organised by the National Fish Workers Union to draw national attention on the question of water, which is becomming scarcer and dirtier, thanks to the wrong development policies.,, The march, which began simultaneously from Calcutta and Bombay on 1st April converged at Kanyakumari for a colourful Hay Day demonstration and an evening public meeting which was to be addressed by Justice VR Krishna Iyer, Tom Kochery and Mathias Saldhana.

This is the first instance of a trade union giving a call to focus national attention on an environmental issue which affects the whole population. The marchers identified and campaigned . against 19 monsters which include the Baliapal missile launch site and atomic power plants at Kaiga and Koodankulam.

Host of the over 10,000 participants (7,000 women) came from the coastal villages of Kanyakumari.Tinneveli and Tuticorin of Tamilnadu. The participants from Tamilnadu and Kerala expressed their determination not to allow construction of nuclear reactors at Koodankulam in Tinneveli district of Tamilnadu.

Immediately after the firing the police disconected the public address system thereby preventing the organisers from addressing the people. The public meeting to be held was declared unlawful. Several environmental groups have asked for a judicial probe in to the incident.

Acoording to the official version, an internal squabble amongst the marchers led to police intervention followed by stone throwing by the marchers. Independent investigations reveal that there was an organised attempt to disrupt the march.

Public participation in the demonstration was by all accounts beyond even the wildest dreams of the organisers. There were more than double the number of people who had gathered in Kanyakumari to hear the Prime Minister during the recent election tour.

LAST RITBS FOR ATOMIC ENERGY?

Members of the Citizens for Alternatives to Nuclear Energy and other activists held a protest programme in Bangalore on 26th April. Dr.B.C.Ramachandra Sharma, Dr. Sumatindra Nadig and Dr.D.R.Nagaraj addressed a public meeting held on the occasion.

Later the activists took out a procession to the Nuclear Power Corporation office and submitted a memorandum demanding stoppage of work at Kaiga. The NPC officials conceded the activists' demand for closing down the office in memory of all the victims of radiation and downed shutters for the day.

Interview with John Goffman

Dr John Goffman is the Professor Emeritus of Biophysics and Medical Physios at the University of California, Berkeley; He was formerly associate director of the Lawrence Livermore National Laboratory; as a graduate student he was the co-discoverer of uranium-233;He has authored several books including Radiation and Human Health(1981), X-Rays: Health Effects of Common Bxams(1985) and Radiationlnduced Cancers from Low-Dome Bxposure(1989)

Several reporters have been asking me about a revival of nuclear power because of worries about the greenhouse effect. Here are- my answers to some of the most common questions.

* "Given the Greenhouse effect, would you still oppose nuclear power if an inherently safe reactor could be designed as nuclear protagonists claim they can do?

YES, I would still oppose nuclear power. ,

Havn't they been claiming that the present designs are safe too? But the truth was stated very well by Dr.Nunzio Palladino, who was the dean of the Pennsylvania Stats College of Engineering before he became the chairman of the U.S. Nuclear Regulatory Commission (NRC) In a sworn testimony on August 21, 1970 before the Pennsylvania State Senate, Palladino said: "Though we can generally tell when we have a very unsafe reactor, it is always hard to know how safe you are with one you believe to be safe."

A recent example in a long series of nuclear engineering 'surprises' occured at the La Salle plant near Chicago. The New York Times reported July 10, 1988: "A huge oscillation in the speed of a nuclear reaction at the La Salle plant has prompted an inquiry into whether a whole class of nuclear plants are vulnerable to a dangerous condition that engineers had predicted was impossible to occur ..."

The problem is not Just surprises. The nuclear record reeks from cover-ups of RECOGNIZED safety problems. And beneath it all, you have got engineers thinking their designs incorporate an "acceptable" margin of safety based partly on a severe underestimates of the cancer hazard if their designs fail. And on top of that, you have got reactors which grow more radioactive, less approachable by humans and more like brittle glass-jars as they operate. The ultimate hypocrisy of safety claims is revealed when representatives of the nuclear community try to con the public into believing that containment structures will prevent catastrophic accidents, when they clearly do not believe it themselves. They keep proving that radiation disasters can happen by pressing for liability limits on radiation disasters which they claim are IMPOSSIBLE!

Given the record of broken promises, 'surprises',cover-ups deceptions and hypocrisy, I think a person would have to be very very naive to rely on any current claims about a breakthrough in safety.

* " So you don't believe that there is an inherently safe reactor coming along?"

Recall the warning from Dr.Palladino. Host of all, realize that radiation disasters can happen in the absence of spectacular accidents. Let us consider some very simple arithmetic:

Thr radioactive cesium-137 produced each year by a 1000 MW nuclear power plant amounts to nearly 4 million Curies. Since its radioactive half-life is 30.2 years, very little of it decays during a year.

According to Soviet estimates, the Chernobyl reac\tor contained a two year cesium inventory of about 8 million Curies. After the accident about 1 million Curies were deposited within the Soviet Union. Approximately another million Curies were deposited outside the Soviet Union in Europe. Combined that amounts to about 25% of its two year inventory, which is the same as 50% of the cesium-137 produced by one year of operation.

Now, let us consider 100 large nuclear plants that are presently operating in the U.S.A. for a life span of 25 years each. Call 'A' the yearly oesium-137 production by one plant.

Then 100A = Yearly'production by 100 plants
Lifetime production = 25Years x 100A/year = 2500A
99.9% containment = loss of 1 per thousand
With 99.9% perfect containment, loss = 2.5A
Chernobyl's loss = 0.5A and hence ratio = 2.5A/0.5A = 5

This ratio, 5, has an enormous meaning. It means that even achieving 99.9% PERFECT CONTAINMENT of the cesium-137 produced by 100 presently operating plants during their 25 years of operation, through all steps of the cesium's handling upto the final burial, would still result in a release equivalent to 5 Chernobyl accidents. This assault on human health would occur without blowing the roof off any single plant. Worldwide there are about 400 plants underway, so that the same scenario (99.9% success in containing cesium) would mean cesium loss equivalent to 20 Chernobyl accidents per 25 years of operation.

Radio-cesium is far from being their only poison. Nuclear power plants produce the same variety of poisons as do atomic bombs. During each year of operation, each plant produces radioactive poisons equivalent to about 1,000 Hiroshima A-bombs, PERFECT containaent is essential.

In addition to the fission products there is radon. Extra radon poison is necessarily released during the process of mining uranium. Radon comes from the deoay of the thorium-230 left in the 'tailings'. In ay 1981 book I have shown that fuelling 1,000 plants would release enough radon to cause 450,000 fatal lung cancers for each year that those 1,000 plants operate. These deaths would not be imposed on ourselves. They would occur over many thousands of years among our descendents. Nice legacy.

* "So you are saying that the poisons are going to get out, even if we prevent spectacular accidents?"

You bet I am. Not Just radon. Fission products get out in the endless series of small leaks, burps, and spills which we hear about. Nuclear pollution requires nothing spectacular. Just the commonplace: leaky pipes, mistakenly open valves, faulty O-rings, cracked coment, stuck needles in a dial, human carelessness and even people literally asleep at the switch.

Fission products are also getting out by INTENTION: the so called "permissible" releases. Today even scientists at the very heart of the radiation community are finally warning that ionising radiation is about 11 times more carcinogenic than they previously admitted. (My independent analysis shows the hazard is worse than that.) Nonetheless, the Nuclear Regulatory Commission (NRC) proposes to designate certain low level waste "below regulatory concern", and to let it go straight into local dumps. And accumulate there. NRC admits some of it might get into people via air and water, but claims the cancer hazard won't exceed "permissible" rates like 1 case per million people.Such proposals, like all other "permissible" releases to the environment, are based on denying the true toxicity, and using dubious data on transport in the environment and promoting the doctrine that it is morally "acceptable" to cut our own costs by contaminating the planet for future generations.

With that kind of moral code, I see no barrier against steps towards the following scenario: You have a nuclear facility with vents and pipes for the "permissible releases" to the environment. Each exit is monitored by a mater, whose threshold for detection can be set at various levels. If you design enough vents and set the detection threshold high enough, *you* could release up to 100% of your radioactive poisons and still produce a monitoring record which says that you released ZERO.

If the nuclear communiy claims that releases from nuclear - power plants cause an average dose below a millirem per year, or that radioactive poisons will be contained to one part per million or whatever, deep skepticism is the appropriate response. It's been earned.

* "So your opposition to nuclear power is based on a deep distrust of the industry?"

The very nature of nuclear power makes it unacceptable, even under a better moral code. I oppose it because it creates astronomical quantities of radioactive poisons which will remain toxic for hundreds and sometimes thousands of years. These poisons cannot be reduced, they cannot be detoxified, they cannot be recycled and they are non-biodegradable. They decay,at their own immutable rates. Even when they are contained, they cannot be disposed off at all - they can only be moved from one location to another,

Ionizingg radiation which is the hazard Iron these poisons, is definitely one cause of heritable genetic mutations and chromosome injuries. When exposures occur after conception, in utero, one of the proven hazards, is mental retardation.

Furthermore, ionizing radiation is not just one entry on a long list of SUSPECTED causes of human cancer - it is one of the few PROVEN causes.In fact it may be the only one where proof now exists that there is No harmless threshold dose or dose-rate. Every bit of exposure adds to the rate of human misery for sure.

So, I have no choice but to regard nuclear power as a loony, demented choice, and a real crime against all our descendents. I have said enough.

Weloome CANE HEWS

A six page antinuclear newsletter from Citizens for Alternatives to Nuclear Energy (CANE) has started publication from Bangalore. The purpose of the newsletter is to "place on record with appreciation and gratitude, the efforts of thousands of people as well as to inform well wishers all over the country of what is actually happening at Kaiga." The appearance of the newsletter is an indication of the strength of the movement against nuclear power in Karnataka. Anumukti sincerely hopes that CANE NEWS will grow from strength to strength and be the forerunner of many such publications from differrent parts of the country.

Address: CANE, 809, 17 Main, 5th Block, Rajaji Nagar, Bangalore

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Address: CANE, 809, 17 Main, 5th Block, Rajaji Nagar, Bangalore 560010

LETTER BOX

Chernobyl day was observed in North Canara district as a day of fasting and protest against the installation of the nuclear power plant at Kaiga. In response to the call liven by the Uttara Kannada Parisara Samrakshana Samiti, Sri Visweswara Thirtha Swamigalu of the Pejawar Butt, Udipi undertook a fast at the gates of the Kaiga project. 500 satyagrahees sarched from different talukas of the district to the reactor site. The authorities had suspended the plying of the state road transport buses from Karwar to Kaiga for two days fearing that they would be used by the protestors. Despite these difficulties the protestors did enter the Kaiga site. It took nearly three hours for the police to round all of thee up.They were taken to Karwar late in the evening where the police refused to feed thee stating that they Mere free to go where they pleased. The satyagrahees spent the night in the open near the police headquarters in Karwar and the next day they took out a silent procession to the deputy commisioner's office. Here, a delegation net hie and presented hie with a memorandum for the Prime Minister. They then dispersed after deciding on the next step in their caspaign.

H.S.Doreswamy
6andhi Bhavan, Kumara Park East,
Bangalore-1

The Narora Atomic Power Plant went critical on the 12th of March, 1989.The process of attaining criticality was kept a secret till the last moment by the DAE. This highhandedness is a demonstration of their utter contcept towards human beings.

A visit to Narora revealed the following shocking facts to us:

1. The mandatory 1.6 Us safety fence has not yet been constructed.
2.People are still living within this 1.6 Kes buffer zone and hence are being subjected to radiation without their knowledge or consent.
3. There have been ruaours of workers having been contaminated during test run's.
4. People are being forcibly evicted by the police though tote of thee have not yet received any compensation.
5.The rehabilitation programme is non-existent. Evicted farmers do not have any work after the current harvest. Horse still they are being forced to live in slums near Narora.
A.Public safety measures leave much to be desired. IAEA regulations state that the public residing it the vicinity of plants must be informed about the hazards posed by these plants; fire, medical and other emergency services tost be geared to handle radiation related eventualities. None of these requirements have been met at Narora, or any of its surroundings - an area of high population density.

There have been serious allegations regarding use of substandard materials in the construction of the plant. Brave risks are being taken with the lives of millions by reckless technocrats.

We are an informal antinuclear group operating frot Delhi trying to raise awareness on this issue, be strongly urge you to take up this task of exposing this fraud now being touted as a 'great achievement.

Rajeev Singh and Ratna Mathur
NONE(Network to Dust Nuclear Energy)
Flat AD-118-B
Shalimar Bagh, Delhi 110052

It was nice to see Anumukti back in circulation after i long, long time. After the National workshop on Nuclear Energy last December, we have brought out a detailed pamphlet in Kannada on what happened it the debate. Me also plan to bring out a CANE newsletter sainly about the anti Kaiga activities in Karnataka.

Sanjay Havanur
61 Central Excise Layout,
Vijaynagar, Bangalore -40.

The issue of nuclear power is getting tore and tort important. I think that is part of our achievement. It is true that we are very far from our goal - but if people like you keep on continuing their activities - it will produce results in the future.

Sometimes I feel that sharing of feelings and warmth between activists is more important than here collection and dissemination of information. Ofcourse I don't sean to say that 'decoding' of information is of little or no importance. But meeting people belonging to the same Mavelengh gives a greater impact which helps the activist. The latest issue of Anumukti was it a way a very good compilation of articles with supportive information. But have you any plans to improve the getup of the journal with pictures and cartoons? It involves money and manpower - I know. But can't we try to collect that resource?

Dr.Smarajit Jana
Ultadanga VIII-M, Housing Society
Flat N0.C3/1
Calcutta 700067

I wish to refer to the article 'Disasterous Drill' in the last issue of Anumukti. I believe that even if DAE falls far short of the accepted standards of performance it the drill, it is nevertheless a desirable drill particularly as we have already acquired a hazardous indesirable set up including nuclear plants and several other industries of equally great destructive capacity. Even people's attention for disaster preparedness so that in the mot of on unfortunate incident taking place, tot danger to lift and property can be ainimised. The exercise also underlines tot great part played by resour in all such disaster situations.

M.K.Jain
Joint Assistance Centre
N-65, South Extension-1
New Delhi ll0049

Last year by uncle became the sarpanch of the village panchayat of Rawatbhata (Kota).Me tells me that the Rajasthan Atomic Power Project authorities discricinate against the local popultion. So mach so, that even basic amenities such as water and medical facilities *are* denied to thea. Even after so many years the project has tot generated any significant employment for the local population. Secondly, they have still 00 knowledge of any safety seasures they sight be reqquired to take in case of a catastrophe.

liked the new issue of Anumukti. Do you have a copy of the Ramarao Committee report? Does it contain anything of significance?

Sunil
Bansalkheda (Saheli)
P.O. Kesala via I tarsi
Moshangabad (M.P.) 461111

Editor's Reply: Although Dr.. M.R.Srinivasan had promised to provide this and other reports at the bangalore workshop last year, and had specifically appointed Dr.M.V.Ramaniah for the purpose, a reqest to Dr.Ramaniah only elicited the response that "one or two document repositories are being planted and one would have to wait till these repositories begin functioning in order to get the reports.*

Rancho Seco: Shut Down by Citizens

The Rancho Seco reactor in California, U.S.A., became the first reactor in the United States to be shot down by the disapproval of voters. In a referendua on June 6th, voters of the Sacramento Municipal Utility district rejected continuation of further operations at the plant, by a vote of 53.42.

Tot Rancho Seco has had a troubled history from its beginning in 1974. Its lifetime capacity is only about 407 and it suffered two 'near misses,' one in 1978 and another in 1985.

The Rancho Seco case takes clear the declining treed In nuclear economics. Although the plant was relatively cheap to build by current standards - it cost only 1375 million - rising operating and maintaianance costs made its electricity uncompetitive.

Sources The Nuclear Monitor June 12, 1989

All APOLOGY -TBT AGAIN!

Anunukti has fallen so far behind schedule that it is a scandal. Mo apology can suffice. The only redemption can be immediate and vigorous efforts to bring Anumukti back on schedule. This we are trying to do. We have numbered this issue Vol.2 No.6 to bring it in line with the date of publication. We hope to despatch Vol.2 No.4 which will mainly focus on energy conservation by the 10th of July and Vol.2 No.5 which will celebrate the bicentenary of the French revolution by highlighting French nuclear imperialism in the Pacific by the end of July. We shall resume regular publication from mid August with Vol.3 No.l.

We wish to thank Shri l.J.Desai for use of his computer which has allowed us to compose this issue. Special thanks are due to Ms Falguni Desai for her help.

Annual Subscription Rates:

Indian Subcontinent: Rs.25/-
Overseas: US $15/- (Airmail)
Please add Rs.8/- for cheques

Correspondence Address:
Editor Anumukti
Sampoorna Kranti Vidyalaya,
Vedchhi, Dist.Surat, 394641

Editor: Surendra Gadekar
Published by S.Gadekar for
Sampoorna Kranti Vidyalaya.

PRINTED MATTBR BOOKPOST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Volume 3 Number 1 August 1989

> "Every truth passes through three stages
> before it is recognized. In the first it
> is ridiculed, in the second it is
> opposed, in the third it is regarded as
> self-evident."
>
> Arthur Schopenhauer

A few days back, I was talking to Suresh, a friend of long standing who has lived deep in the jungles and worked amongst tribals. "Who are these PEOPLE that you are trying to reach?" he asked. "If, what you want to say does not reach the really down and out, if it makes no difference to the life of the last person, then is what you are doing, worth doing?"

To all engaged in social activism, this is the central question - the 'Yakshaprashna'. It is a question that all of us need to ponder over. The bulldozer of development rolls on, ever more ruthlessly, crushing the weak. The displaced person or rather unperson feels, - whether she be the housewife who needs to trudge further everyday to gather fuel for the family's next meal; or the small child working his finger to the bone producing carpets out of his lost child-hood; or the senile old man staring vacantly at the brand-new 'sarovar' beneath which lies his home - powerless facing this relentless onslaught.

To empower the people, so that they don't continue living "half-lives", requires not only organisation but also knowledge. What you don't know, may kill you. And you need to know of ozone holes and china syndromes; of ppm's of CFC's and storage of MIC's.

It is a hopeful sign that a convention of the "project affected" people is being organised in Madhya Pradesh. The time has indeed come when all dispossessed whether due to dams, deforestation, nuclear power plants, giant mining projects, 'super'thermal power stations, city beautification schemes, wastelands development .... realise the common cause of their woes. The time has also come to reach out and the other 'dropouts' of development - the terrorists, the drug addicts, the goondas, the 'antinational separatists', etc. and bring them into the mainstream of public life in a way radically different from that being attempted by political parties and the law and order machinary today.

Long years ago, Gandhi gave us a talisman -

"Recall the face of the poorest and the most helpless man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will it restore him to a control over his own life and destiny? In other words, will it lead to Swaraj or self rule for the hungry and also spiritually starved of your countrymen?"

Birthdays are for introspection. A time to look inward and a time to look forward. Anumukti enters its third year (a bit later than it ought to have to our continuing regret) determined to carry the truth from being ridiculed to being self evident. Gandhi's talisman remains our guiding star. All must join in the task to make the truth recognised by the "poorest, lowliest and the lost."

CHALO HARSUD

Millions of tribals and rural poor of our country are today fighting a battle for their survival; The forces of destruction in the name of development, unleashed in our country over four decades ago have already displaced over 8.5 million people and threatened the livelihood of the majority of our countrymen.

The government is going ahead with its plans for large scale projects, ignoring the advice of those who suggest that the ill-effects on the environment, the quality of life, and indeed the very culture of our people need first to be considered. Attempts to reason with the authorities have failed time and again.

Throughout the length and breadth of India the story is the same. Dams such as Tehri, Bodhghat, Inchanpalli, Suvarnarekha, Pcoyamkutty, Koel Karo, Sardar Sarovar, Narmada Sagar, Pollavaran, etc. threaten to drown forests and displace tribals and rural poor. Missile testing sites such as Baliapal and nuclear power plants such as Kaiga, Kakrapar, Koodankulam, Narora and Nagarjunasagar besides mining sites such as Singrauli, Jaduguda and Gandhamardan serve to destroy common lands and peoples' livelihoods. These projects have not only resulted in unmitigable losses but have never accrued the benefits, which were willfully overestimated to begin with. They have only contributed to the fuelling consumerism and in increasing disparities. The simple question,"who pays and who benefits?" remains unanswered, even as those displaced more than three decades ago from Bhakra, Koyna, Pong, Ukai and a score of other projects still seek justice from the nation.

The rising tide of struggle against such state sponsored destruction has been ignored, and sometimes even crushed by the government. The time has come for all of us to unite in a mass demonstration of collective strength. To effectively focus national and international attention on this just cause it would be appropriate to meet at Harsud in Madhya Pradesh where over 250,000 people to be displaced by the Narmada project are struggling to safeguard their lives and environment.

For too long have we struggled in isolation. For too long have the exploiters prevailed. In the manner of Gandhi let us now force an uncaring powerful few to take notice of the aspirations of the majority. Let us form a human wall to stop the destruction of our life support systems.

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DATE: 28.9.1989

Dumperial Designs

Last year, doctors in the Nigerian town of Koko started seeing patients with unexplained skin rashes, vomiting and headaches. The problems were traced to a dump, where barrels of waste shipped from Italian chemical factories were leaking poisons into air and water.

The discovery touched off a chain of events unprecedented in Africa, where environmental protection is often considered a luxury. The Nigerian government impounded Italian ships, arrested businessmen and threatend death sentences. The Italians took the waste home, only to encounter angry crowds on Italian docks ides who tried to keep the waste from being unloaded. The incident was not the only one of its kind. There have been more reports of dangerous dumping in the Third World, • from American incinerator ash in Guinea (presumably to make bricks) to Italian chemicals in Lebanon.

Bangladesh has been the latest target. Events of the past few months, have been alarming in this regard. Attempts are being made to import toxic and even radioactive industrial and medical waste in the guise of energy supplying materials. It is proposed to burn the waste and utilise the heat produced for electricity generation. These wastes have been totally rejected by industries in the U.S. The ash from the incinerator will have concentrated amounts of toxic materials which can have catastrophic effects on surface and ground water. The project had reached a sufficiently advanced stage of processing through the government when some officials and journalists raised an alarm. The government has now set up a committee to look into the matter. There are also strong rumours to the effect that a ship named Felicia/Khian Sea has dumped 15,000 tons of toxic wastes in the Bay of Bengal.

Hard figures on the trade in toxic waste are sparse. It is estimated that in the U.S. alone, 275 million tonnes of industrial waste is produced each year. 135,000 tonnes are exported. But the pressure to export is increasing. Greenpeace reports that 3.7 million tonnes of waste of all sorts was shipped from industrialised to developing countries between 1986 and 1988.

The biggest incentive to export waste is money. As environmental regulations in rich countries have become more demanding, the cost of burying hazardous waste has risen' sharply. In the U.S., it has increased from $15 in 1980 to $250 today. Incineration can cost $1500 per tonne.

Groups such as Greenpeace want an. outright ban on exports of hazardous waste. They say this will force firms to develop sound ways of recycling waste, or of changing processes to prevent its production in the first place.

In March this year, the United Nations Environment Programme (UNEP) finalised a treaty on the control of transboundary movement of hazardous waste. After much heated debate, in the end, only 34 of the 105 countries present at the convention in Basel, Switzerland, signed the treaty.

The treaty is riddled with loopholes and controversies which render it ineffective. It does not call for an outright ban on toxic waste trade. It merely regulates the trade. It only insists that the companies wishing to export waste will have to notify the goverment of the country importing it and receive prior informed consent. The treaty does not define what is 'hazardous'. Thus, there is little to stop an exporter from labelling waste as non-hazardous and leaving it upto the importer's detection abilities to spot the difference. There is no mechanism in the treaty to ensure that the waste can be handled adequately by the importer. A company can dump anywhere as long as it can 'persuade' a local official to say that it is all right to do so.

From:Third World Network Features

FOR THE SAKE OF PURITY OF TUNGA

Our river Tungabhadra has not dried up, it does flow through our villages even today! Nor have we felt it as unholy, in spite of the pollution; we do continue to seek her blessings, more especially on auspicious days. But we have to admit that she has suffered neglect. The people who believe that "progress" and "development" lies in using everything they set their eyes upon, came, as they came everywhere. They lured us into the belief that having a giant industry was a panacea for all our sufferings.

Thus some sixteen years ago Harihar Poly Fibres and GRASIM industries came to use our mother Tungabhadra. Their callousness resulted in multiplying our miseries. Our mother turned into a flow of chemical water - brown and stinking. Not only "large fish kills" started happening once in a while, but even our nets got devoured fast by the polluted water. Our agriculture suffered, our cattle became sick. Our women wondered where to clean clothes and utensils. Not only all of us elders, our children too became victims of "progress" loosing their health. Most sorry part of the situation was our failure to find a remedy to this.

We became absolutely helpless. This we learnt has happened everywhere, where the demon of industrialization has set its footprint. What can you do to a giant capitalist like the BIRLA? What can be done to the mighty State Government which has a Pollution Control Board and a Health Department that looks upon all this as a ' necessity for "NATIONAL GROWTH"? We talked and regretted, we fretted and feared. We felt we had no choice but to sacrifice ourselves to the satanic dance of modernizing our "backwardness"! Pure clean water of the Tungabhadra was to be a historical memory!

Some six years ago, one day our children did not return from their schools as usual. What happened? This mischievous lot that was always after us understood that if Tunga was to be "give us food" and all their unwanted demands and pranks were not to be found. They were still in the school even when darkness had engulfed the village. Something was really happening at the school. A group of trainee teachers had come from Gujarat. To be at the school those days children felt it was all fun, "nay real work and involvement!"

When our village teachers had sought help to host these teachers we supported them out of curiosity, more out of our traditional sense of hospitality. "Look upon the visitor as God himself."

But these visitors were very different people. They helped our children to handle glass test tubes and chemicals. Within a couple of days the children had selected and analysed soil of every field and that of the smallest farmer. It was amazing to see the entire plan of the village fields all prepared by our own "monkeys"! Not only the children learnt their self respect we too learnt the lessons of self discipline.

With the change in our children in less than fifteen days we too were affected. The evening discussions and the cultural programmes organised by these visitors brought more light and enthusiasm amongst us. This started slowly the rivulets of our finding out that we should not lose heart. We learnt how foolish it was to believe that a factory could give us happiness. We also felt that the mistake was to be corrected. But how?

We had gone as a mob previously under the leadership of politicians to storm the factory and seek compensation. But the result was totally devastating. Not only that some of us had to suffer physically because of police beatings but our morals too sank down. The politicians left us as they were purchased by the factory people. We lost faith in them and in ourselves and were thus doubly frustrated.

But after this teachers' camp we of government officials. This made us purified, not someone from outside but all and everyone of us had to contribute. Our first lesson was not to have leaders. So we formed our village Parisar Samitis. These met and met again and again to think and to seek and to ask and to understand how best to start.

Luckily we thought of a "Vigil Line" in front of the factory. That was in October 1984. Some couple of hundred women and men stood there in silence to declare their unhappiness about the deterioration of the environment because of the effluents being poured into the river by the factory. Factory authorities had sought police protection and had created a scare. But looking at our. peaceful nay silent demonstration understood us better. The police officer said, "how on earth could this factory management believe that these peaceful folk were going to be violent? You are within your rights to protest. We will not bother you." A current of happiness and confidence electrified us all. Perhaps this was the birth of the positive stream that started to change the waters of the Tunga.

News went round all the forty villages about this demonstration. In the next such demonstration the locally elected politicians and even the member of parliament had to join to claim empathy with the people. They had to follow the people. We gained confidence that saying 'NO' to pollution was having results. Even the factory authorities moved, sent feelers, asked for talks, agents came to pacify and discuss!

Camps in non-violent training, writing letters to concerned government officials, organising protest marches, environmental jathas, streams of action started trickling down from everywhere. We started deciding for ourselves about what next could be done.

Hiremath, a highly qualified man from Dharwad and one who had been with us since 1982 came up with the idea of burning up his man-made fibre clothes and wearing hand spun woven khadi. He was emulated by people from seven villages. Some burnt their clothes in front of the factory and some in front How can we accept any wages? We have to remember our fight for freedom against the British when Gandhiji gave us a call burn all foreign clothes. Durgapa Barki our fisherman from Medleri spoke to the women of the village a day previous to his deciding to burn his rayon clothes. "Why I am doing it is very simple to understand. It is not just giving up use of factory made clothes. We also have to see how we can cooperate to bring better living to our own village craftsmen. We will have to start buying our potters' pots prepared right here in the village and we will have to buy chappals made here by our neighbours!" More and more light started to shine on us as to what had gone wrong. And with each one coining forward to live up to seeking alternatives to evils of industrialization, our spirits soared.

Dr.Kaboor a noted physician gave up his roaring practice to join the folds of the volunteers. Dr.Pawar started as a "fellow traveller" but soon got so involved that he seems to have forgotten .that he has patients to attend. Dr.Pawar's sister had never ventured out of her home. Not only she, but her friend too joined us. Families from cities, households from villages, women from homes and workers from fields came and surrendered themselves to the cause that was finding real roots. They gave up their mundane needs, started constructive work, organising weekend camps and padayatras. Planting useful trees and preparing seedlings provided individuals not only means to earn but also an involvement in the movement for purifying Tungabhadra. These small actions and village meetings brought forth purer and purer blood to the body of the movement.

A daily wage earners' camp 'coolies' as they call themselves - was organised for a weekend. They were chosen by their village. Their village had assured them of three days wages. But at the end of the camp they would not accept the wages. 28 women and men all refused saying, "We had the privilege to represent our village. We have learnt so much here, and we received food without doing any work, slowly the water has changed its colour.

contribute to our fight against the factory." These and many more such sincere actions provided the haemoglobin to our anaemic society.

Journalists and lawyers, scientists and doctors, all started to join our efforts. The stream has now become a rivulet and is moving on to be a river.

Like a river our movement has grown. Something trickling from one corner, some drops from over a rock and so -on. Various sources everywhere contributing to make it a success.

In 1986 the state government of Karnataka joined hands with the factory to overwhelm us by leasing ten thousand hectares of village common lands of over four districts. These lands were given to a Joint Sector company to grow Eucalyptus trees to be used as raw material for the pulp and fibre production by the factory. People's rights on these common lands were taken away almost by a stroke of pen!

They wanted to thwart a river? But the tables 'got turned. It brought more people to join hands to fight the common enemy. Protest marches, "Pluck and Plant" programmes started in all four districts. Yes, the movement spread and got more strength. Instead of being with the people, the government had supported, no promoted, the cause of the factory. "Birds of a feather flock together", they say. But every action of theirs boomerangs!

Our pluck and plant demonstration was to pluck out the factory-planted eucalyptus trees to plant fruit and other more useful trees for the villagers. It provided a unique example of how things change. The assistant commissioner - representing the authorities and the government, - intervened between 2000 villagers and the 40 hoodlums who were engaged by the factory to create violence. He said we will be allowed to plant more useful trees supporting the villagers and replace 100 plants planted by the factory. Yes, the government at the grassroot level understood us better.

Not that we have won. Purifying Tunga is a dream we feel sometimes! But confidence. The factory now sometimes runs its effluent treatment plant. Small beginnings in their minds are felt by us.

The state High-Court had sent a commission to investigate the state of destruction by pollution. It was more or less an attempt to condone the 'industry. But the truth came out in the commission's report. "There is a nalah from the factory to the river by which the effluent is directly put into the river without treatment." The report also made a request that " since this nalah has existed all these years the Pollution Control Board should permit it as of the day it was made." Thus it is that however much they try all their actions result in exposures of total neglect and callousness of all health and environmental regulations. It seems as if, they fall in the traps they have themselves laid.

The Samaj Parivartan Samudaya has let us find that "people need to and can develop a macro-perspective of a free democratic , secular, egalitarian, non-violent, non-exploitative and just society while working towards it on various issues in a micro-situation and by trying to build links with different sections at various levels." It has helped us find a wider perspective. We know we are not alone. We also know that our efforts are helping many more groups of people all over Karnataka and perhaps in other states too to find out what needs to be done.

Thus this small river of people's strength is slowly gaining involvement of more and more areas and groups. During this growth we have learnt many lessons. The most significant are the following:

1. Not to have a leader, or follow a call of an individual however powerful or imposing he might appear. But try and understand the problem - go to the roots and start correcting by small actions that can be taken by many.

2. Small actions, even writing a letter to officials by entire village people do carry weight. These limited actions also help in building up

6. Keep a relentless effort going

3. Demonstrations have their Usefulrtess as morale boosters but these should be held only after intensive training in non-violence and after having had thoughts and reflections on the action.

4. Ready-made solutions do no help. Seek solutions together. Mob actions appear encouraging at times, but often serve no useful purpose and may result in greater frustration.

5. Real action comes out of determination of a few. The determination comes after well considered reflection by the group. A real training in deciding arid owning up responsibility.

on, on all fronts. Legal action as well as local action; constructive work as well as confrontation.

7. Let everyone feel that it is their own movement. City people and salaried people, farmers and coolies, women and old, all of them should contribute whatever they can to create a real people's movement. We will have to collect every drop of devotion and honest sacrifice.

8. This is a very difficult task, we know. But we are determined to see our mother Tunga purified.

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Report from Koodankulam

With the entry of farmers from Kanyakumari district, the resistance against the proposed nuke station at Koodankulam is taking a new turn. On 27th August, over 120 organisations representing farmers, fish workers, women, students and environmental groups said "No to Nukes". There were also representatives from various opposition parties barring CPI and CPM.

The meeting was chaired by Thomas Kochery of the National Fishworkers Federation. The delegates were convinced that nuclear power is an evil that has to be resisted with all one's might. Even the farmers, whose main concern is the diversion of waters from the Pechiparai dam - the major source of irrigation in Kanyakumari district - resolved that they would fight even if Pechiparai water is spared.

Till now, the Koodankulam campaign was lead by various fishworkers' unions, students and environmentalists. From now on, the movement will be coordinated by the newly formed Anti-Koodankulam Committee with Dr.Kumar Das, Ex-MLA as convenor. The meeting unanimously decided to conduct a signature campaign, continue the mass education and contact programme, hold workshops and seminars in colleges and organise a demonstration at Nagercoil in November this year as a massive show of people's determination.

The South Indian environmentalists are meeting at Ootty in the Nilgiris on the 22 September to chart out their future action plans. This is bad news for nuclear barons especially in an election year. The Department of Atomic Energy (DAE) still remembers its earlier setback in Kerala where the proposal for the Kothamangalam Atomic Power Plant was withdraw because the people forced all the candidates to oppose the plant. A similar strategy is likely to evolve for Kaiga, Nagarjunasagar and Koodankulam.

Nuclear establishment has by now realised that its "education" programme has not been well received. From now on it seems that there will be more reliance on police and the other coercive apparatus of the government. For instance, Tom Kochery was asked by the Nagercoil administration to keep his activities confined to Kerala. Anton Gomez, a journalist who has been working among the fish workers of Tamil Nadu also had to face police highhandedness.

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Victory at Wackersdorf

Gorleben is a small village in the north of West Germany. It was chosen as the site of the republic's first large scale nuclear fuel reprocessing plant. However, strong antinuclear protests begun well before the commence-ment of work on the first phase of the plant forced the planner's to abandon plans and to look for an alternative.

Under the active patronage of the veteran Bavarian conservative Franz Josef Strauss who had been one of the main architects of the West German nuclear programme, Wackersdorf, a site in the south of the country began to be propagated since the early eighties. Here, the construction of a nuclear fuel complex was considered politically feasible. The population, living mainly on agriculture, was promised employment in this "high-tech" industry. Nobody expected any resistance.

A word about Herr Strauss. Known for long as the 'strong man' of W.German politics, his death last year prevented him from seeing the gradual dissolution of his nuclear dreams. Strauss had allowed West German ratification of the Non-Proliferation Treaty only after an amendment was passed which limited the period of the treaty to the year 1995. Precisely the year when both, the reprocessing plant at Wackersdorf. and the commercial scale fast breeder reactor at Kalkar were scheduled for completion. The combination of the two plants being an important step enabling FRG to make its own nuclear weapons!

The . resistance of the local population together with antinuclear initiatives from all over Germany, developed in a way not anticipated by politicians. Wackersdorf became a symbol of the 'nuclear state'. The government retaliated brutally - "The largest uninterrupted deployment of police and Bundesgrenzschutz (special task force for border protection) against protesters in conditions resembling civil war". Irritant gases and rubber projectiles were used to crush demonstrators and to end blockades.

For a time it appeared that protests and appeals to reason were fruitless. With the growing resistance against the plant, the government merely increased its propaganda offensive. Only in 1987, did a change in attitude became perceivable. Of all the arguments against the plant - dangers of a nuclear accident; the health problems due to radiation during 'normal' operation; the fact that even after Wackersdorf the waste problem remained as insolvable as ever; the military implications of the programme; the evils of large scale industrialisation; the financial unviability of the programme; - only this last argument was eventually accepted by the authorities.

Slowly, one by one, the big financiers began to drop out of the project. The exodus began in 1935 when one of the largest electricity producers in FPG reduced its shares in the company responsible for operating Wackersdorf. After construction on the first phase of the plant had started, it became obvious that the financial outlay of 3 billion Marks was not realisable. More and more industrialists, declared the project as too expensive and not economically viable. With the death of F.J.Strauss, political commitment to the plant also declined. On the other hand, the British and the Frncli governments offered cheaper fuel reprocessing at Windscale and Le Hague respectivly. In an age of decreasing tensions between East and West, nuclear weapons' proponents in W.Germany seem to be loosing ground.

Suddenly, no one in FRG is ready anymore to bear the financial risks involved in building new nuclear plants or other large related facilities. Neither the breeder in Kalkar, nor the dream of the German nuclear industry the thorium high-temperature reactor - ever seem likely to be built. Nuclear technology will, however, . remain an export item.

What will happen to Wackersdorf? Within the half-constueted ruins of the site, a research centre for solar energy is said to be planned. Siemens, the multinational giant wants to invest in this project. Thus, Europe's energy future is likely to remain firmly in the hands of large industry. Without radical change in the economic system, the soft-energy future will be determined by the masters of the atomic past!

Rainer Adloff
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Report on Cuttack Seminar

One benefit of antinuclear protest in the vicinity of various nuclear power plants has been the great interest it has aroused in the issue of nuclear power in different parts of the country. The eastern region of the country being the coal belt, is not immediately threatened by reactor siting. Even nucleocrats admit that on their own accounting, nuclear generated electricity can compete with coal only 800 Inns from the pit heads. Besides the region is prone to severe cyclones and both these factors have for the present proved a constraint on reactor construction there.

However, in these times, when political considerations take primacy over good sense, natural barriers provide no guarantee of long lasting relief. Nuclear power's central funding proves too much of an attraction for impoverished state governments and their electricity boards to resist. Thus, the governments of both W.Bengal and Orissa despite the variation of ideology, covet nuclear power plants.

Prompt and active opposition by an informed public is the only safeguard against these assaults on the environment and the citizenry. Both W.Bengal and Orissa have been lucky in having public spirited groups which are alive to the nuclear menace and have organised preliminary meetings to debate the issue.

The seminar at Cuttack was a two-day affair on August 5th and 6th organised by The World Union and Utkal Gandhi Smarak Nidhi. Originally it was planned to have a debate between some antinuclear spokespersons and representatives of the Department of Atomic Energy (DAE). However, the persons invited by the organisers from DAE after accepting the invitations had second thoughts and decided that discretion was the better part of valour and hence did not turn up. Thus, there wasn't much debate though a number of papers were read on different aspects of the nuclear issue. The subjects ranged from nuclear weapons, safety, waste disposal, radiation hazards to biological systems, nuclear politics to the use of nuclear energy in medicine and agriculture. It needs to be pointed out regarding the last mentioned that the radioisotopes needed for such purposes are required in such trace amounts that there is *in* reality no connection between production of radioisotopes and nuclear power gerneration. Every time there is any discussion on the desirability or otherwise of nuclear power, these "uses' are sure to be mentioned. Thus their 'usefulness' as the 'Shikhandi' of nuclear power technology is undeniable. There were also lively discussions on the role and the responsibility of scientists in bringing about social change.

The conference ended in a well attended public meeting which resolved that no nuclear plant contruction should be started in Orissa without a public debate which would help the formation of a consensus on the issue. To facilitate such a debate, it is imperative that there be free flow of information from the DAE.

Ten Years of Fallout

In march 1979, the Shall had just left Iran, Jimmy Carter was the President of the United States, and the world suffered its first major nuclear plant disaster at Three Mile Island in Pennsylvania. Much has changed in the past decade, including the state of the nuclear industry. But one thing endures -the highly radioactive remains of the THI reactor.

Disaster Strikes

When the first alarms sounded in the chilly predawn hours of March 28th, the operators at the almost new TMI-2 plant thought they were facing another routine malfunction. Indeed the series of small mistakes made before and during the TMI accident were surprisingly mundane.

A minor problem in the plant's plumbing caused the turbine of the THI reactor to trip early in the accident, disconnecting it from the steam being produced by the hot reactor. The unconnected steam jetted into the night sky with a roar. Only mildly concerned, the shift supervisor's first call was to his counterpart at TMI-1 reactor, which was down for repairs, telling him that he would have to do without TMI-2's power.

It was at this point that the accident became serious. Critical water valves were mistakenly closed. Another was inadvertently stuck open. Operators shut down the emergency core cooling system at a time when it was badly needed, and then an hour into the accident mistakenly turned off the main coolant pumps. The water surrounding the core of the reactor slowly leaked out over a two hour period.

Bedeviled by flawed equipment, a shortage of key data about critical water levels and temperatures, and hundreds of warning lights and alarms, the TMI operators made a bad situation worse, and soon had the plant on the verge of catastrophe. Within minutes of closing the coolant pumps, the core began to overheat.

Meanwhile, a hole developed in the primary cooling system, allowing hundreds of thousands of gallons of radioactive water to fill the basement of the reactor's containment building to a depth of eight feet. Some of this water was automatically pumped into an auxiliary building, where small amounts of radioactive gases were released without warning into the sky.

As the temperature of the reactor core exceeded 5000 degrees Fahrenheit, the rods containing the uranium fuel ruptured. At least 70% of the core was damaged, and more than one third of it melted, flowing downwards like "hot olive oil," according to one expert's description. The molten remnants of the core then coagulated at the bottom of the reactor building.

Most of the details of what happened at Three Mile Island were not known until days after the most critical period had passed. The opperators themselves and the nuclear experts from around the country were puzzled by the event, mislead by inaccurate gauge readings and reluctant to believe correct measurements because they were so far outside the norm. The plant's owners repeatedly misinformed the public in their haste to downplay the seriousness of the accident.

In the months and years since the accident, it has become clear that this was a most serious accident, one that could have caused immediate loss of human life. A grave tragedy was avoided at Three Mile Island in part because the core- was uncovered for only a brief period. In addition, because the plant had been in operation"for just three months, the core contained only small' amounts of radioactive fission products that are most dangerous to life. There is a controversy about whether deaths can be directly attributed to the accident. Even if it did not kill people, TMI revealed technical and human flaws in the safety systems essential to the safe operation of nuclear plants. In the years since Three Mile Island, U.S. nuclear plants have experienced nearly 30,000 mishaps, some with the potential to have caused disasters more serious than that at Three Mile Island.

Picking up the Pieces

After several months of study, the presidential commission on the TMI accident estimated that the plant could be returned to service by 1934 at a cost of $466 million - a challenging but feasible task. Ten years and nearly $1 billion later, the project is still not finished. Not only is returning the plant to" operation no longer being considered, the reactor's owners are attempting to get permission from officials to leave some radioactive material sealed inside for decades.

Like the construction and operation of nuclear plants, the cleanup of a destroyed reactor can be a minefield of optimistic projections, trial and error procedures and unpleasant surprises. Many of the techniques used to dismantle THI had to be invented and in some cases reinvented during the course of the project.

When the cleanup operation began, experts were confident that they would find the fuel assemblies intact. However, in 1982, when a remote camera was first lowered into the reactor vessel, workers found a large empty space where part of the core should have been. When they finally got access to the pressure vessel six years later, the cleanup crew found rest of the core - 20 tonnes of it buried in radioactive rubble at the bottom of. the vessel.

These discoveries showed for the, first time that part of the core had melted and the cleanup would be a vastly more complicated operation. The rubble, too radioactive to be approached by workers would have to be ' chopped into pieces and removed from the vessel by remotely controlled devices. Numerous pipes, pumps, walls and other equipment that had been contaminated by the slumping core would have to be extracted and stored as radioactive waste.

The centrepiece of the cleanup effort is a huge steel and lead platform built over the reactor to give workers safe access to the core. Workers lower shovels, pliers, buckets, cutting torches and other devices through an 18 inch hole in the platform on 40 foot poles. These extend to the bottom of the reactor vessel, which is filled with water left over from earlier cleanup efforts. Debris from the damaged core is leaded into protective cannisters before being raised out of the water. Complicating the handling of this material is the fact that it is dangerously radioactive, even after a decade.

The cleanup is further hindered by the constant need to develop new types of remotely controlled equipment. All of these devices must be directed using special television cameras that are also lowered into the vessel. Early in the cleanup, bacteria and algae began flourishing in the warm water, limiting visibility to only a few inches. It was not uncommon for expensive equipment to be lost in the murky bowels of the pressure vessel, requiring costly recovery attempts.

Atop the platform the life of a cleanup worker is not easy. Even the thick layer of lead and steel is not enough to stop 10 millirems of radiation per hour from seeping out, roughly equivalent to getting a chest X-ray every GO minutes. When large pieces of radioactive debris are pulled out of the water, radiation levels go far higher. For this reason workers are clothed in cumbersome decontamination suits and plastic smocks, layers of special gloves are peeled off and discarded every 15 minutes. Shifts are less than 4 hours and workers are permitted on the platform only one week in six.

The most difficult part of the operation is the removal of the solid layer of radioactive debris that coagulated at the bottom of the vessel, a process that is still going on. The cleanup crew uses a specially designed diamond tipped drill to break up the material, then winches the fragments some of which weigh half a ton, out of the reactor.

The projected completion date for

the cleanup operation has been postponed on almost an annual basis. The latest date is at the end of 1990, but there is simple room for more delay. Whereas company executives first said that the reactor would be restarted or at least fully decontaminated, they now plan to simplify their, task by leaving some radioactive debris in the plant until at least 2020 - "post defuelling monitored storage," - in nuclear jargon.

The Aftermath

Three Mile Island has become a symbol of the nuclear industry's problems. Public concern has intensified and knowledgeable scientists and local officials have joined the chorus of opponents. California has passed a law forbidding more nuclear plants in the state until a solution to the waste problem has been found.

Safety devices and regulations in the pre-TMI era were clearly inadequate. Everything from control room layouts and the training of operators to the standards for particular welds had to be altered. This resulted in a great burden on the builders of many plants then still under construction. Components had to be replaced or rebuilt. Cost overruns already out of control, became astronomical.

The average construction cost of a nuclear plant built during the eighties in the U.S. has been $3,700/kilowatt. During the haydays of the sixties the expectation was that nuclear plants would cost $150/kilowatt to build.

Adding construction and operating costs today, nuclear -power is twice as expensive as competing energy sources such as gas fired cogeneration or fluidized bed coal plants. At the time the nuclear costs have, gone up, technological improvements have allowed a reduction in the costs of these and other electricity sources. During the past five years, for example, the cost of installing solar photovoltaic cells has fallen from $10,000 per kilowatt to $5,000 per kilowatt, while the cost of wind power has fallen from $2,000 to $800 per kilowatt. It is cheaper still to generate electricity by saving electricity through more efficient light bulbs, appliances and other devices.

Hereditary Problems

Nuclear proponents are now trying to light a new flame - a generation of "inherently safe" reactors intended to be impervious to meltdowns. Lawmakers under pressure to come up with alternatives to fossil fuel plants that cause air pollution and global warming are being lobbied to fund a rebirth of nuclear industry.

Today's light water plants have obvious inadequacies that the new plants would supposedly rectify. Three major alternatives, each intended to avoid the possibility of a TMI-type accident, are gaining attention. One is a modified light water reactor that differs from the current design mainly in having a larger and cooler core. This design still relies on elaborate redundant safety systems. The "PIUS" reactor being promoted by Swedish scientists is a sharp departure from present day designs. The core is to bo housed in a pool of water containing boric acid that would automatically flood the core and cool it in case of an accident.

The third design is the high temperature gas cooled reactor. This has a very different type of core, with the uranium encased in billions of tiny ceramic spheres that limit the potential heat buildup. Fission automatically stops of its own accord if the core overheats. Such a system would work only if the reactor were restricted to about 100 megawatts - one tenth the size of today's plants.

While each of these designs has its advantages, none is free from potential problems. Meltdowns are not the only kinds of nuclear accidents. Realtors can also be subject to hydrogen explosions (one " of the fears at TMI) or a runaway reaction, as at Chernobyl.

The misfortunes of the entire nuclear industry show that .engineers' best intentions and detailed calculations do not ensure reliability. Indeed, the concept of "inherent safety" may be an engineering mirage, implying a degree of certainty and flawlessness that is beyond the scope of foreseeable nuclear technologies.

More Nuclear Boondoggles?

The current hope of the nuclear advocates is to have the government fund the construction of a demonstration reactor, perhaps under the auspices of the nuclear weapons programme. However, the government has an abysmal record in managing large nuclear projects, including the decaying U.S. nuclear weapons complex, which will cost upward of $100 billion to clean up during the next 20 years. Another is the Clinch River Breeder Reactor, which was a managerial disaster that cost $1.5 billion before being stopped by the Congress in 1934. A uranium enrichment plant in Ohio begun in 1977 was abandoned in 1985 after $3.5 billion went down the drain. That blunder alone wasted more money than the U.S. government has spent on all renewable energy R&D during the past decade.

Safer Alternatives

A nuclear revival would at best bo a slow endeavour. A demonstration plant would take a decade to build and to prove itself reliable. It would take another decade before commercial reactors begin to come on line, and a third before there was enough- nuclear power to supply significant energy. Energy efficiency by- contrast, could make large contributions in a matter of months and renewable energy sources in a few years.

Today in the U.S., nuclear R&D spending is nearly five times that of spending on energy efficiency and nearly six times that on renewable energy - both of which are not only indisputably safe but far more likely to stop global warming before it seriously affects the planet.

Alternatives such as energy efficiency and some renewables are already cheaper than current nuclear plants ,and, most likely, any "new generation". Non-nuclear energy sources are the only ones that can be honestly termed "inherently safe". Moreover they will not take 30 years to come on line, and will never create a symbol as powerfully negative as the cooling towers looming over Three Mile Island.

Source: Christopher Flavin, World.Watch

Hotspots Galore

A recent United States General Accounting Office (GAO) - (an office similar in purpose to our CAG) - report has found severe radioactive contamination at nine nuclear sites, all of which had supposedly been decommissioned. Three of the sites had been released for unrestricted use. At five sites, radioactive waste had been buried, but nobody knew the type or the amount of waste buried. Records were incomplete or non-existent.

According to GAO, ..."all five sites have groundwater contamination levels higher than federal drinking water standards allow." One site, Kerr-HcGee's Cimarron uranium enrichment facility - most famous as the plant where Karen Silkwood worked - had groundwater contamination 400 times the standards. Another site in Erwin, Tennessee has contamination 730 times the federal drinking water standards.

In all, the GAO looked at nine sites. All had various levels of contamination. The problems at the U.S. Department of Energy's 17 nuclear weapon's plants are now well known. Although, no single civilian site may be as contaminated as the weapon's sites, there are far more civilian radiation users, including 112 reactors plus several already shut down, 22 fuel cycle facilities, 54 research reactors, and 23,000 other licensed users of radioactive materials.

If only one percent of these sites turn out to have contamination problems, the clean up cost will dwarf the tens of billions of dollars estimated to be necessary for the cleanup of the weapon's plants. With the GAO finding severe contamination problems at all nine of the sites it examined, the outlook is not promising.

The Nuclear Monitor 21.3.'89

Daring the last two years we have made special efforts to link with other kindred groups through excliangés of information unci literature. As a result we nowadays got a large number of papers and journnals not normally easily available in India. Beginning with this issue we intend to have a regular column to introduce/review different magazines, books etc. so that you too can have access' to this world of information.

peace news
NONVIOLENCE IN ACTION

On September 1st, 1939 as German tanks started rumbling towards Poland, heralding the begining of the most destructive war yet in human history, the first issue of Peace News hit the stands. Ever since 2,316 more have come out with the objective of bringing about non-violent revolution. In their own words:

"The nuclear arms race must be opposed. But it is only an extreme form of violence which is inherent in our society. Its other manifestations include sexism, racism, war, brutality, hunger, inequality and the exploitation of people animals and the environment.

Peace Mews seeks to oppose ail forms of violence, and to create positive change based on co-operation and responsibility. ' To create a non-violent world, wo must avoid violence in our struggle for change, since aims and means cannot be separated. The concept of non-violent revolution draws on the traditions of pacifism, anarchism, feminism, human rights, animal liberation, socialism and green politics.

We believe in breaking down hierarchies and demystifying skills. Peace News is produced by an editorial collective independent of any organisation. It is non-profit making and depends on its survival on the generous support of its readers."

EXTRACT

If everything goes according to plan a small group of American businessmen will become millionairs by collecting rubbish. And a group of Pacific Islanders will, for the second time in the last forty years become guinea-pigs for American poisons.

It's in the best tradition of Western free enterprise. Having polluted their own environment to the point where an outraged American public has forced health and safety standards on waste dumps, American industrialists and local governments are glad to find an alternative. The newly formed Admirality Pacific company (AP) hopes to make $23 million profit in 1991 and $77 million profit per year from 1994 on.

With 7,000,000 tons arriving annually from 1994 on, the Marshalls will get $56 million per year - more than the annual budget of this Micronesian archipelago, where 43,000 people live on only 73 square miles of land.

Although it sounds innocuous, "household garbage" is laced with toxic wastes. Just the five years worth includes more than 125 million pounds of hazardous material, much of which will leach into the surrounding environment - the scarce fresh water acquifer and the Pacific Ocean. Even AP's President Dan Fleming admits that "there is no such thing as non-toxic, non-hazardous garbage."

Although there is significant Marshallese opposition to the plan, many local people support it. Senator Tony DeBrum who has lead the Marshallese opposition says, "We have had to suffer the brunt of nuclear testing. We have had enough of American garbage out here. It is one thing to do something out of ignorance and fear, but to do it again for money would be inexcusable."

Peace News: 1.9.'39.

LETTER BOX

It was good to receive the last two issues of Anumukti after the prolonged gap. The attempts of the DAE to steamroller all opposition to nuclear projects by repeatedly asserting the same semi-truths and falsehoods are by now a familiar experience. With Doordarshan in the hands of the government, it sometimes seems a hopelessly uphill task to make heard the voice of concerned dissent. I am referring to an edition of the Doordarshan's "FOCUS", aired of July 30th (I think !) where the so-called discussion .on nuclear power was merely an opportunity for Dr.M.R. Srinivasan and others who are alreauy deeply committed to nuclear energy to put forward the establishment's views. Shashi Kumar as moderator, questioned the wisdom of establishing nuclear plants very diffidently and apologetically - more as a matter of form than as any genuine argument against these plants. However, since Doordarshan's bias is by now fairly obvious and its credibility low; such exercises are not unduly worrisome on their own.

What saddened me, was the conviction with which some youngsters towed the DAE line at an inter-collegiate debate on the subject. This debate was held to mark Hiroshima day, by the "Young Hen's Christian Association" . Those who spoke for the establishment seemed entirely convinced of the truthfulness, wisdom and sensibility of the pronuclear energy strategy. The danger according to me lies not so much in believing unquestioningly what the nuclear barons say, but in considering dissenters as a bunch of irresponsible, frightened dreamers whose patriotism is questionable. In fact as you rightly pointed out in an earlier issue of Anumukti there seems to be no communication of ideas between the two groups. That every one of the arguments in favour of nuclear energy is at least questionable seems to be outside the perception of the nuclear energy lobbyists.

Then there was this most frightening aspect of the debate: youngsters calmly arguing that India needs to keep up its nuclear programmes in order to develop a nuclear weapons capability. If anyone doubted the hypocrisy of the government's statement that our nuclear energy programmes are purely peaceful, they should have heard these students. Obviously they have read between the lines very well and then merely stated the' unacknowledged but very real corollary to our allegedly peaceful plans.

Let me quote from a report on the "Agni" missile published in the June 15th issue of India Today, to show that it does not take very much to put two and two together -". . . with the Pokharan explosion, of 1974 India had demonstrated its ability to make a nuclear bomb. In 1980, the SLV-3 rocket launched the country into the space age. All that was missing was the vital third leg of the strategic triangle - a potent medium range ballistic missile capable of carrying a warhead over long distances." Of course "Agni" 'has been; successfully launched and the gap covered. To quote further, " Agni can also act as delivery system for a nuclear warhead with its destructive potential, with plutoniuin production in India's nuclear reactors and a number of Agni missiles deployed at strategic sites, India's deterrence factor is multiplied enormously."

Glory, glory, hallelujah, India is a superpower at last! Brothers in Pakistan beware, we could annihilate you and ourselves too in the bargain.

I am truly ashamed to find our nation being called a superpower. The connotations are entirely negative. Does it matter nothing if another million babies die miserable deaths from poverty and poor sanitation, or if a thriving people are reduced to beggary, as long as our missile bases are established and our scientists can boast of their ability to create weapons of mass destruction? Truly has Gandhi been murdered in the land of his birth !

Indira Vijaysimha
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R.T.Nagar, Bangalore 560032

A few points that emerged during and after a meeting with Dr. Dhirendra Sharma on August.14th here in Bangalore.

1. Dr. Sharma asked that we all support Anumukti and request you for the price of bulk mailing. It was found that many of us speak to different audiences all the time and when we leave we just hand out a folder or two and there is very little follow-up. The decision was that some of us could receive Anumukti in bulk and distribute it.

2. We all seemed to be in agreement that there should be a regular column of news from Kaiga in Anumukti.

3. Some of us felt that Anumukti should be based on the WISE format and should not carry lengthy articles or reviews - which some of us may already be aware of or have access to.

Hemachandra Bassappa
for CANE group
21, Railway Parallel Road,
Nehru Nagar, Bangalore

Your effort is praiseworthy, though it involves a lot of pains. In my view Anumukti should be strengthened at the national level. CANE as well as friends from Bombay should pitch in and help you with this work. But at the same time you should be prepared to "row the lonely furrow'

I believe that long articles are read by very few people. Thousand words should be the upper limit for an article. Calcutta Convention (Anumukti Vol.2 No.G June '09) deserved a bigger coverage.

Recently India Today's Newstrack (10.6.'89) has a very good video clip on Narora. It is of 20 minutes duration and is the result of the efforts of Shri Shanturn Seth.

Dhirendra Sharma
M-120, Greater Kailash II
New Delhi 110048

My name is Keiko Dekai. Rev.K.Yoda is a friend of my husband. I heard about your anti-nuclear movements in India from Rev. Yoda. He told us, you want some contact to Japanese who studying nuclear power plants. We've got shock when Rev.Yoda told us India starts to built nuclear power plant in 'Orissa. Orissa is one of a most holy place, because Ashoka stopped violence, because Gandhi Jee walked to Puri. Why nuclear power plant in Orissa !! I really expect you are getting more and more power.

Anyway, my English is not good, so I can't give you information exactly, what Japanese movements going on, I send you "Nuke Info Tokyo". I think you better contact to this paper.

I also send you "Is It Too Late?" Many Japanese read this book, then they change them mind, and stand up to stop the nuclear power plants.

Nukes, No!! Why people can 'be stupit. People must be stady. I wish your beautifull future.

Na Mu Myo Ho Ren Ge Kyo

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Apologising again and again for not sticking to the scheduled date of publication is disgraceful. Why can't you publish on time? Others do.

Shri Hari Singh
Kumarikata via Rangia
Dist: Kamrup, Assam

Subscription Rates:

Rs.25/-per year South Asia
U.S.$ 15/-per year air mail overseas
(Rs.200/-per year if paid for in India)
Please add Rs.6 for cheques

Editor: Surendra Gadekar
Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :
Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist:Surat, 394641 INDIA
Published by S.Gadekar for

Sampoorna
Kranti Vidyalaya.

Printed Matter Book Post

ANUMUKTI

Volume 3 Number 5 **April 1990**

A JOURNAL DEVOTED TO

When I decided to give up a career in physics and take to full time antinuclear activism, many of my physicist friends were sceptical. Not that my career was any great shakes, but still it did provide the daily bread. "All that you really need to do is to take a few months off and write down clearly all the arguments against nuclear power and then convince the policy makers about them. After all what you are saying is not something radically new. Other countries are in the process of abandoning nuclear power and anybody reasonable can see the force of these arguments", so went their plea.

No doubt, physicists are somewhat naive when it comes to predicting the 'real world'. But to-day, four years later, even my friends are convinced that it is not mere sweet reasonableness which is going to drive out nuclear power or any other anti-people technology from this land. Is *Anumukti then* doomed to failure? A battle for a cause already lost!

No, because there is a language that policy makers do understand— the language of organised mass protest. And it is heartening to see that protest is beginning to bloom everywhere. In Eastern Europe it has blossomed like a desert flower after rains. Old, long hidden, skeletons have come tumbling out of nuclear cupboards as freedom, the right to know, accountability of public officials, become the key words in the new order. It seems increasingly likely that nuclear power has no future in that part of the world. Already a number of projects have been postponed, cancelled or abandoned unfinished as a direct result of public agitation.

At home too, people are becoming aware of the fact that without protest, survival itself becomes difficult. It is a hopeful sign that activists in Kerala have already started organising in response to the nuclear lobby's Interest in the State. The victory at Kothamangalam needs an encore. But what is especially encouraging is the fact that even at Rawatbhata in Rajasthan-the site of India's first CANDU readors-that people have realised the false promise of the nuclear future. The moment of waking heralds a new dawn.

Kakrapar to Rawatbhata Cycle Yatra

Sampoorna Kranti Vidyalaya, Vedchhi is organising a cycle rally from Kakrapar to Rawatbhata to commemorate Chernobyl accident and as a mark of protest against the continued government support to antipeople nuclear policies. The rally which would commense on April 10th, would mainly pass through adivasi lands of Gujarat and Madhya Pradesh and reach Rawatbhata on April 24th in time for the antinuclear convention being organised there. On the way there would be a large number of small public meetings at which participants would try to raise public conciousness on the nuclear and other 'development' issues. Attempts would be made to make contacts with individuals and small grass-roots groups so that an effective organisation can be built for the future.

The rally will focus attention on four main themes:

(1) Nuclear energy has proved to be neither safe nor clean nor cheap. Recent findings in other countries (BEIR V-report, Sellafield leukaemia clusters, privatisation fiasco in U.K. etc) just show that nuclear energy is an even bigger failure than was apparent even a few years back.

(2)Although the rationale behind installation of a nuclear facility is local development - it is precisely the 'locals' who dont develop. Thus, even after 17 years of an operating reactor and almost 30 years after the decision to build the plant was taken, people who live in villages surrounding Rawatbhata Atomic Power Plant (RAPP) have yet to receive electricity, drinking water or basic emergency medical services from the plant.

(3) Big dams - besides causing large scale environmental degradation themselves - are precursors of atomic power projects. This has happened at both Rawatbhata (Rana Pratap Sagar dam on river Chambal) and Kakrapar (Ukai dam on river Tapti). The new proposed dams on the Narmada too - despite all protestations regarding fulfilling the drinking water needs of thirsty people of Kutch and Saurashtra - would no doubt be strong attractors for a future nuclear power plant.

(4) All over the world nuclear power has paid special 'attention' to indigenous populations. Whether it is uranium mining, or location of nuclear installations or nuclear weapons (peaceful nuclear device) testing, it is the indigenous people who bear the greatest risk and get the least benefit. The route of the rally lies mostly through adivasi land to highlight this injustice.

Singing a New Tune

A report by the National Research Council of the US National Academy of Sciences (NAS) has concluded that the risk of exposure to low levels of radiation are at least four times — and in some cases, up to 14 times — greater than previously acknowledged by most radiation scientists. The long awaited *Biological Effects of Ionizing Radiation (BEIR - V)* report, released late last December, confirms the view held by dissident scientists. Mainly, that there is no safe dose of radiation and that the risk of radiation exposure follows a linear model. The reports findings are expected to lead to new standards for workers in the nuclear industry worldwide.

In 1980, the Academy's *BEIR-III* report had adopted a "linear- quadratic model", which presumed that low levels of radiation offered little to no risk. BEIR-V report is based on more recent data about the amount of radiation released by the atomic bombs dropped on Hiroshima and Nagasaki, which was considerably less than previously believed, and also on the fact that bomb survivors are developing cancers at much higher rates than projected by *BEIR-III*. The report is a step in the direction of vindication of such antinuclear pioneers as Drs. Rosalie Bertell, Alice Stewart, Irwin Bross, Thomas Mancuso, John Goffman, Earnest Sternglass, the late Karl Z Morgan and many others much of whose work had previously been ignored or ridiculed by the nuclear establishment.

Using new information the report concludes that the risk for solid tumour cancer is three times greater than previously believed while the risk for leukemia is four times greater. The report also found a much greater risk of mental retardation among unborn babies exposed to low level radiation during the eighth to fifteenth weeks after conception. The report found that women are slightly more likely than men to develop cancers from low levels of radiation and that in some type of cancers, children are more susceptible than adults.

The BEIR-V report also concluded that normal background radiation poses a cancer risk up to 14 times higher than acknowledged in BEIR-III. According to the report, between 520 and 600 fatal cancers will be caused by lifetime exposure of 100,000 persons to 100 millirems annually - an average background dose. BEIR-III had predicted that only 25 to 119 fatal cancers would develop. However, BEIR-V only measured fatal cancers; the risk of developing non-fatal cancers is another 50% greater.

The panel was not charged with making public policy recommendations based on its conclusions and it did not attempt to do so. But Warren Sinclair, president of the US National Council for Radiological Protection, the panel which sets radiation exposure limits in the US, said that "present occupational limits will very likely be reduced" because of BEIR- V. There will most likely be an even more drastic reduction when a future BEIR-VI takes into account the recently released data on the 500,000 workers in the US Department of Energy's nuclear weapon's facilities.

Meanwhile Back Home....

The Atomic Engergy Regulatory Board (AERB) has cautioned against the abnormal increase in the total radiation exposure at almost all nuclear establishments in the country. Prof. A.K. De chariman of AERB, said that the Board's Safety Review Committee had noticed that the total radiation exposure at nuclear power stations had gone up to 1,700 man-rem. It has asked the stations to bring the figure down to around 1,000 man-rems. Each individual should not be subjected to more than one rem of radiation. In 25% of the cases at Rawatbhata (RAPP) and Kalpakkam (MAPP), the reading had gone up to 2.5 rems. Recently RAPP was shut down for a few days as a result of increase in radiation in take.

Source: Indian Express 11.3.1990

Conscripts Construct CANDUs

The world knows that the regime in Romania led by the late Nicolae Ceausescu was founded on brutal repression and routine violations of human rights. Since Ceausescu's execution, it has also become clear that Canadians played a role in that repressive regime through the deals made by Canadian government agencies to build CANDU nuclear reactors in Romania. Forced labour has been reported on the construction of Canadian CANDU reactors in Romania, and Canadian External Affairs officials admitted that they had previously received reports of conscripted labour being used at the nuclear megaproject. It seems that "commercial considerations caused countries such as Canada to overlook Ceausescu's villainy."

We believe that everyone should be entitled to an energy source that's cheap, clean and efficient. That's why we, at CANDU, recommend......
...SLAVE LABOR!!
ROMANIAN ELECTRIC

Canada began negotiating the sale of these reactors in 1967. By 1977, Canada was reported to be close to an agreement with Romania for the construction of up to sixteen reactors. That same year, Canada and Romania signed a nuclear cooperation treaty that included nuclear weapon non-proliferation safeguards. In July 78, an agreement was signed covering the engineering services for one reactor, and by October that year, Atomic Energy of Canada Ltd. (AECL) announced that Romania had agreed to buy two reactors and most of the heavy water needed to run them. In August '83 construction on two reactors began at Cernavoda, a small city on the Danube River, dose to the Black Sea.

In retrospect, barter trade arrangements, negotiated to allow Romania to pay for reactor parts without currency, may have contributed both to the hardships that Romanian workers have endured, and to predictable financial losses for certain Canadian manufacturing industries. While most Romanians were chronically short of clothing and food, and living in dwellings with only minimal heat, Romania was exporting millions of dollars worth of garments and food products to Canada. These goods were apparently sold at bargain prices across Canada, thus undercutting comparable Canadian-made items. Romanian plate steel, imported under the same conditions, is reported to have cost Canadian steel companies in excess of $10 million in lost sales. Most Canadian nuclear suppliers, with the exception of AECL, took 100% counter-trade on all their sales to Romania. Romanian steel plates that were part of the trade deal eventually became subject to Canadian dumping tariffs.

An independent study of AECL's commercial transactions, published in 1987 by the Economic Council of Canada, confirms that the crown corporation's export history has not been profitable. It was estimated at that time, that AECL had cost federal taxpayers $12 billion (1981 currency) since its inception. Clearly, AECL's difficulties in selling CANDU reactors abroad, and the Canadian nuclear industry's fears of financial collapse were prime factors in this highly questionable deal with Romania. Unfortunately, the Romanian workers, upon whose industrial production the deal was founded, were a captive and impoverished workforce. Canadian officials did not let the prospect of Romanian deprivation affect their willingness to do business.

The deal with Romania covered not only the construction of nuclear reactors, but also the transfer of nuclear technology, and the proposed sale of heavy water. At each successive stage, this deal brought Romania closer to having the capacity to produce nuclear weapons. As Romania became increasingly unstable in the 1980s, the risk this deal posed to international security should have been clear to Canadians. Concern was highlighted in 1985, when AECL signed an agreement that gave Romania the right to re-sell CANDU components to other countries, thus increasing the risks of horizontal nuclear proliferation. With Romania now in a politically volatile state, it is difficult to predict whether construction on the CANDU station will continue and if non-proliferation agreements will be adhered to by the new Romanian government. The Romanian election, to be held in May, will no doubt bring more news about whether construction of the five reactors at Cernavoda will continue or not.

Rod MacLeod

Nuclear Awareness News Winter 1989/1990

Chernobyl— The Sad Saga Continues

Between 1987 and 1989, a further 150,000 people (in addition to the 135,000 people evacuated at the time of the accident) were evacuated from contaminated areas in the Soviet Union. They had accumulated high doses of radiation through continued exposure to the fallout from the 1986 disaster. Another hundred thousand more people can expect evacuation between 1990-1992, when they approach the already too high emergency permissible radiation limit. At least 60,000 people mainly young persons and professionals have already left the areas without waiting for compensation or official resettlement. More than 220 villages have been already abandoned and some 600 villages and towns were included in a programme of systematic decontamination.

In 1989, it was officially acknowledged that an area of about 10,000 square kilometres in various parts of the Ukraine, Byelorussia and the Russian SSR was contaminated with cesium-137 to levels higher than 40 Ci/square km and was considered dangerous for human habitation. About 150 villages are now waiting for the next wave of evacuation. In some still inhabited "hot-spots", levels of radioactive cesium as high as 90 — 140 Ci/square km have been found. The local population, particularly children are already suffering adverse health effects.

A significant part of the heavily contaminated area is far from the reactor site - in some cases between 100 and 400 kilometres away. High contamination was caused due to the fact that it rained on these areas during the time the damaged reactor was belching out radioactivity. Levels of cesium-137 between 15 and 40 Ci/square km were recorded over some 22,000 square kilometres during 1989. Western standards presently consider even 15 Ci/square km as unsuitable for agriculture, particularly livestock farming.

Some reports indicate that some 100,000 sqare kilometres of land in the European part of the Soviet Union has levels of cesium-137 and strontium-90 higher than 50,000 Bq/square metre. However, these rural areas and even those with contamination levels above 500,000 Bq/square metre, continue to be farmed although the agricultural produce from there is required to undergo special treatment. According to the regulations, livestock must be transferred to clean feeding about two months before slaughter. Milk is used only to make butter and cheese. But because of food shortages, violations of the rules are common.

Approximately one million people live in areas now designated as "permanent strict radiation control" areas. The Ministry of Health has raised the maximum permissible limit of radiation dosage in these areas far above internationally recommended limits.

Sources: The Environmental Destruction of the Soviet Union" Zhores Medvedev The Ecologist Vol.20 No. 1 January 1990.

Rawatbhata : Development Brings Dissatisfaction

Rawatbhata near Kota in Rajasthan is being made into a large centre of nuclear generated electricity. The construction of the first reactor started in the sixties and by late 1973 the reactor had begun commercial production. The second unit commenced production on 1st April, 1981. Construction of the third and fourth unit has already begun and four more units are proposed. All these units are situated on the banks of the Rana Pratap Sagar dam reservoir. Within a 100 km distance three other dams have been built on the Chambal - the Gandhi Sagar dam, the Jawahar Sagar dam and the Kota barrage which together form the Chambal valley plan. All the dams produce hydroelectricity besides providing water for irrigation through a network of canals. On the top of this there is a thermal power station in Kota. A number of large industries have already started functioning there. One would expect that with so many 'temples' of modern development all concentrated in one place, the people of this region would be contented, happy and staunch supporters of the 'development' process. In fact before reaching Rawatbhata this is precisely the impression one gets - where once there was a jungle in which tigers roared, today there are new and newer colonies, shopping centers coming up by the minute. New buses run up and down Rawatbhata's roads.

But on January 13th, 1990, there was a meeting in Rawatbhata where an absolutely contrary picture emerged. This meeting had been called to discuss the benefits and the harm caused by the local nuclear power plant. It was attended by the sarpanches of two other villages besides Rawatbhata, a number of locally elected officials, farmers, tradespeople, unemployed youth besides some representatives from outside. In the meeting it became obvious that local people share feelings of disappointment, anxiety and anger and they feel that all these reactors, industries and dams have been of no use to them.

The meeting was chaired by Shri Kishanlal Gupta the former chairman of Bhaisroad Paochayat and a resident of Eklingpura village. He said that the area was once a very good jungle and pasture land from which the local residents got various kinds of fruits, roots, leaves, wood, cattlefeed and other produce. The tornado of development has laid bare all this. The local residents have not benefited at all. Even today, most neighbouring villages do not yet have proper roads so that in an emergency the villagers could be taken elsewhere in a hurry. Although Rawatbhata is such a major electricity generating centre and supplies electricity to all parts of the northern grid, but the local farmers are still pining for electricity connections. He mentioned instances of farmers whose applications for electricity connections were still pending after ten years. In the same vein, the Rawatbhata village panchayat chairman Shri Ratanlal Gupta said, "The village Tamlav situated right next to the reactors is yet to receive electricity". There are also villages in the area where drinking water is still a serious problem and the water has to be carried in tankers during the summers.

Another fact which was illuminated during the discussions at the meeting was the discrimination practiced by the RAPP authorities between their own employees and the local population in matters relating to basic facilities. The local people have great difficulty in getting tap water connections. Even in cases of severe emergency, local people are not treated in the hospital attached to the power plant. This, despite the fact that there is no other hospital in the vicinity. In fact the government ought to set up a special hospital and hearth centres to deal with the damage caused by the radioactive pollution of the nuclear power plant. Even the suez of the colony of employees of RAPP is allowed to flow freely through the localities posing a grave health risk. The Rawatbhata village panchayat has drawn the attention of the authorities many times to these problems through correspondence and only received empty reassurances in return.

Expectations regarding jobs and other employment opportunities are naturally aroused in the neighbouring villages the moment a large project is announced. But most of the jobs go to the well educated from the cities and metropolis while only manual work is left for the local people. The same has happened in Rawatbhata. The unemployed youth in Rawatbhata have organised themselves into a union which has raised the demand of local employment. Two days before the meeting they had carried out a 'Rasta-roko' agitation. The chairman of the union Shri Rajesh Singh Rajora told the meeting in very clear terms, "We do not want any new reactors here - they are of no use to us."

There is a great deal of anxiety amongst the local population regarding radiation hazards of nuclear power plants. The disasters of Bhopal and Chernobyl are particularly to the fore in peoples minds. There is no information regarding what kind and amount of damage an accident can cause; what to do in the event of an accident; what are the possibilities of an accident at Rawatbhata; what are the emergency plans of the authorities etc. On none of these points have the authorities been forthcoming with information. About one and a half years ago an excercise was carried out to test emergency preparedness. However, since the authorities have always maintained that an accident was impossible, the local residents wonder why the need to have emergency preparedness drills. Last September there was a gas leak in the heavy water plant which caused a great deal of panic in the area. The security guards and the employees had decamped wearing masks in trucks. The residents of Tamlao village had also felt the smell of the gas. But the authorities have tried to cover-up this incident calling it a rumour. Due to this their credibility has reduced greatly. Any criticism of the atomic energy programme is labelled by the authorities as the work of foreign inspired people who want to weaken the country. There was a consensus at the meeting that the authorities have no other excuses left to offer. Ratna Mathur, who had come from Delhi said that the reality was just the opposite. Prosperous countries are cutting back on their nuclear programmes under the pressure of public opinion generated by Chernobyl. Hence there is a maximun pressure from them on the Third World nations to accept the useless technology, hardware, instruments, etc. which they want to dump.

Authorities also claim that whatever the dangers involved, electricity is necesssary for progress. But as one person said in the meeting, "There can be no development at the cost of human life." Rajeev Singh from Delhi clarified that the restart of Rawatbhata Unit 1 after there was a crack in the end-shield was not an achievement to be proud of but rather a crime against humanity considering the risk involved. Nowhere else in the world is a reactor with a crack in its end shield being operated. Sunil from Hoshangabad said that nobody could believe the authorities. They are going ahead with their programme despite growing protests only because their vested selfish interests are involved. They do not consider the local population any better than insects and treat them accordingly.

The slowly gathering storm of protest in Rawatbhata is about to break. The authorities of RAPP have started following a carrot and stick policy of simultaneously giving concessions and suppressing dissent. They have promised to make a junior college in Rawatbhata village. Shri Ratanlal Gupta, the Rawatbhata village sarpanch said that there was a proposal to supersede the village panchyat along with panchayats of another two villages and to incorporate them into a special development authority whose control would be exercised by a government appointed administrator. This way. the protest voiced by locally elected village officials could be silenced.

The meeting ended by forming a struggle council (sangharsh samiti). The samiti has decided to collect information on this issue and has called a conference on 25th and 26th of April, at Rawatbhata for this purpose. They want to establish a dialogue with other struggle movements and have invited representatives to come to the conference.

There is no doubt that modem development projects are raising anxities and fears amongst the people not only at Rawatbhata. It is also apparent that the high priests of development have no answer to calm these fears.

(Translated from Hindi)
Sunil
Lohia Academy
P.O. Kesala District Hoshangabad 461111 M.P.

A "Parmanu Pradooshan Sangharsh Samiti" to fight against the radiation pollution caused by nuclear power plants both operating and proposed in the Rawatbhata area has been formed. The samiti has decided to commemorate Chernobyl day by calling a two day convention on April 25th and 26th, We invite friends and workers from other regions to come and join us. There are regular buses every hour from Kota to Rawatbhata starting from Gumanpura bus-stand between 7 A.M. and 10 P.M.

Contact: Shri Ratanlal Gupta — Sarpanch Rawatbhata Panchayat.

Radiation Kills Children of Nuclear Workers

An alarming UK study linking childhood leukaemia to fathers exposed to radiation has created furor in Great Britain and elsewhere. (See Box) The study found that children living in Seascale, a village near the Sellafield nuclear reprocessing plant, were ten times more likely to suffer from leukaemia than children in the general population; one in five of the children with the disease studied had fathers who worked at the plant. The study, led by Professor Martin Gardner of Southampton University on behalf of the British Medical Association (BMA), was published in the *British Medical Journal* on 16th February, and was picked up immediately by the British media, making the front page of virtually every daily coming out of Britain and prompting calls for action.

Results of case-control study of leukaemia and lymphoma among young people near Sellafield nuclear plant in West Cumbria.

Results : Expected associations with prenatal exposure to x rays were found, but little information was available on viral illnesses. Relative risks for leukaemia and non-Hodgkin's lymphoma were higher in children born near Sellafield and in children of fathers employed at the plant, particularly those with high radiation dose recordings before their child's conception. For example, the relative risks compared with area controls were 0.17 (95% confidence interval 0.05 to 0.53) for being born further than 5 km from Sellafield, 2.44 (1.04 to 5.71) for children of fathers employed at Sellafield at their conception, and 6.42 (1.57 to 26.3) for children of fathers receiving a total preconceptual ionising radiation dose of 100 mSv or more. Other factors, including exposure to x rays, maternal age, employment elsewhere, eating seafood, and playing on the beach did not explain these relationships. Focusing on Seascale, where the excess incidence has predominantly been reported, showed for the four out of five cases of leukaemia and one case of non-Hodgkin's lymphoma whose fathers were employed at Sellafield and for whom dose information was obtained, that the fathers of each case had higher radiation doses before their child's conception than all their matched control fathers; the fattier of the other Seascale case (non-Hodgkin's lymphoma) was not employed at the plant. These results seem to explain statistically the geographical and employment associations with Sellafield that were found.

Conclusions : The raised incidence of leukaemia, particularly, and non-Hodgkin's lymphoma among children near Sellafield was associated with paternal employment and recorded external dose of whole body penetrating radiation during work at the plant before conception. The association can explain statistically the observed geographical excess. This result suggests an effect of ionising radiation on fathers that may be leukaemogenic in their offspring, though other, less likely, explanations are possible. There are important potential implications for radiobiology and for protection of radiation workers and their children.

British Medical Journal 17 February 1990

The BMA study found an unusually high incidence of leukaemia among children living near the Sellafield plant in Cumbria, in the northwest of Britain, and provides the strongest link yet between leukaemia clusters with nuclear power facilities. Media reports are calling it the first study of its kind in the world, but in fact it is the latest in a long line of studies (most of which have so far been ignored) that show that radiation is considerably more dangerous than what was assumed when the current safety standards were set. Where it differs from most other studies, though, is in the genetic implications: The study suggests that radiation at Sellafield effected the sperm of men working there, possibly introducing a genetic mutation. It found that where workers received only 10 mSv in the six months prior to conception, their children also faced a 6-8 fold increase in risk of developing leukaemia. (The current annual dose limit is 50 mSv). It is not, however, the first time that damage to sperm has been linked to radiation. For example, according to Greenpeace, genetic implications of radioactive exposure on nuclear submarines were revealed in a study which showed that between 1972 and 1975 four babies born to submarines on the Polaris submarine HMS Resolution were born with hare lip and cleft palate. In 1986 Dr. Maha Linet, then at Johns Hopkins University in Baltimore, looked at 309 cases of childhood leukaemia in Shanghai. She and her Chinese colleagues found that the disease was more common in the children of men who had diagnostic X-rays before conception than in those of men who had not. The risk of cancer increased with the number of X-rays that the men had been given. Similarly the fifth report of the *Biological Effects of Ionising Radiation series* (See also "Singing a New Tune" page , this issue) describes Japanese research which shows that two out of the 1,630 women pregnant at the time of the atomic holocaust gave birth to children who subsequently contracted childhood cancers. Normally fewer than one in 1,630 would be expected.

The scientists in the BMA study found that of 52 local children who had leukaemia between 1950 and 1985,10 had fathers who worked at Sellafield. The link was strongest where the father had received particularly high doses of radiation before the child's conception. Scientists and engineers at Britiish Nuclear Fuels (BNFL), which runs the Sellafield plant expressed "deep concern" and called for urgent action to reduce radiation dose limits for employees. At the same time, however, BNFL said that while the report came from a "respectable source", it did not believe it established a link between radioactive discharges from the plant and childhood leukaemia.

Workers at Sellafield were told about the findings before they left work on the day before the study hit the front pages. Shop stewards began considering their response that night, but already the Transport and General Workers Union, on behalf of the industrial unions in the nuclear industry, a/e calling for urgent action. On March 6th three families, in which the father works at Sellafield and the children have cancer, served writs on British Nuclear Fuels as a result of this study. Martyn Day, solicitor for families claiming that their children were made ill by radiation, said that already half the children involved were dead. Susan D'Arcy believes that her daughters leukaemia is directly linked to the Sellafield plant. Her daughter Gemma, is one of the three children in one school to have contracted the cancer in the last two years. The other two children died. Gemma who is six years old, is at present in hospital following a bone- marrow transplant. Gemma's father, Stephen D'Arcy, has refused to support his wife's test case against BNFL saying, "It's a bit like biting the hand that feeds you." BNFL employs around 33% of the population of the area. At Sellafield alone, there are some 14,000 people working at the plant, and thousands more depend on it for a living.

In a follow-up story on the study on Sunday after it was released, *The Guardian* ran a headline saying "Cumbrians Calm on Sellafield Report". But the article itself contradicted this. One person interviewed, Christopher Merlin, who had already begun a lawsuit against BNFL after plutonium from the plant was found in his household dust, predicted it would have a "disturbing effect on marriages in the area." Another man said, "I would be worried if I were starting a family. I've worked there for four years." Even a woman who said, "yes, people were taking it calmly and there was," she thought, "no panic", went on to add, "Yet I think young people are bound to think twice about whether there is any risk." Let's hope the authorities who set dose limits think twice, too.

Source: WISE News Communique 326
The Economist March 10, 1990
Peace News February 23, 1990

The discovery of a clear statistical link between the exposure of men to excessive radiation and leukaemia in their children is a calamity of dreadful proportions for those directly affected. The anguish of a father of a child suffering from this serious and sometimes fatal disease will be increased immeasurably by the suspicion that the origin of such suffering may after all be in himself. Such families need and deserve all the support and sympathy a compassionate society can muster. So serious are the implications of this discovery that the only sound basis for public policy in response must be to act as if the suspicion was already proved. Further research is essential, but it must not be used as an excuse for delay. The investigation by Professor Martin Gardner of Southampton University is evidence enough for action. It is already being hailed as a model of its kind, and may become a classical demonstration of the detective power of environmental epidemiology, the science of investigating statistical patterns of disease in pursuit of clues to medical causes and effects.

The implication must be faced, painful though it is, that any man who has been exposed regularly to radiation in the course of his employment may run some risk of fathering children who may eventually contract leukaemia. One of the first priorities of research must be to identify that group at risk as accurately as possible, for there must be thousands of men whose work brings them into contact with radiation who will today be fearful about their own families. They need reassurance as fast as it can be obtained, based on solid scientific investigation. Meanwhile the entire nuclear industry is faced with a real emergency. Radiation safety levels will have to be reviewed once again, and almost certainly substantially lowered. This is also a case where it will be not sufficient to await the final dotted T or crossed T in the laboratory, but where the only right basis to proceed for the time being will be to assume the worst.

The Times (London) 16.2.1990

Events

Talk by Dr Rosalie Berteli

On 28th February, 1990 a lecture on the "Health Hazards of Low Level Radiation" by Dr Rosalie Bertell was organised in the Indian Merchants Chamber Hall in Bombay. The organiser was F.I.AM.C. Bio-Medical Ethics Centre of Bombay. The lecture was co-sponsored by a number of organisations including *Anumukti.* Dr Biswatup Bannerjee a physicist from Tata Institute of Fundamental Research presided and Mr Justice Y.V. Chaudrachud - the former Chief Justice of India was the chief guest. The lecture was attended amongst others by many scientists, medical personel and journalists.

Dr Rosalie Bertell who is the author of *'No Immediate Danger — Prognosis for a Radio-active Earth"is* a very famous figure in antinuclear circles all over the world. Two years ago she was awarded "The Right Livelihood Award"— the "Alternative Nobel Prize" for her pioneering work on effects of low level nuclear radiation. She has been a fighter for human rights especially for the rights of the weak and the dispossesed Trained originally as a statistician she presently is the President of the International Institute of Concern for Public Health. She has a special relationship with India since she is involved in a long-term study of the effects on the naturally occuring (high) low level radiation in the monazite sands of Kerala.

During her talk she sighted many studies in which she herself had been involved to stress the pernicious nature of low level radiation. The point she stressed was that increasing radiation pollution is a form of random murder. What we are actually doing is to deplete the strength of the gene-pool. In the long run we will be producing children who are less able to cope with pollution than were their parents while at the same time we're degrading the environment so that they have more to cope with.

Of special interest were her preliminary findings of the study of 40,000 fisherfolk and a comparable control group living on the sands in Kerala. She confirmed that there had been an increase of three to four times as much in congential diseases like epilepsy, cleft lip and pallette, infertility, Down's syndrome etc.

She also talked on the role of standard setting bodies like ICRP (International Council for Radiological Protection) which though they recognise the various ill effects on biological systems of radiation like injuries, general lowering of W.B.C. counts, cataracts obesity, impaired fertility, shortened lifespans, increases in cardio-vascular-renal diseases as well as in autoimmune lymphoid diseases; only take into consideration fatal tumours while setting standards.

Medicos Say No to Nuclear Energy

Medico Friend Circle (MFC) in its XVIth annual meet on "Radiation and Health" held at Gandhigram Rural University from 26th to 28th January resolved to oppose the production and use of nuclear energy as being too hazardous for the health of human beings and to demand that existing nuclear facilities be de-commissioned and no new nuclear plants be built.

The discussion in this meet was divided into four broad areas:

1) Basics of radiation and health and the experience of nuclear power plants;

2) Health-hazards of common radiological investigations;

3) Food irradiation;

4) Other sources of radiation from consumer products - Electronic Display screens for instance.

Most of the discussion and background material was focussed on the first area; a clear consensus also emerged.

During this discussion, it was pointed out that authorities allover the world have concluded that the quantum of radiation, how so ever small, invariably cause damage to human issues and that there is no level of radiation that can be considered safe. Production of nuclear energy damages the health of the people through exposure to ionising radiation at all stages of operation. Mining and milling, transport of radioactive material, burning of nuclear fuel in the reactors etc. cause radioactive contamination of the environment. There is enough scientific evidence to this end. Moreover what is of grave concern is the nature of the health hazards caused by ionising radiations which could to the foetus, genetic mutation after many generations and would be carried over to future generations as well.

The MFC meet underlines the special significance of these health hazards which would affect the very quality of human race in the future generations to come. Added to this is the predicted adverse effect on the power to resist infectious organisms and other stresses. These alarming health hazards are reasons enough to outright reject nuclear power.

The participants of MFC meet emphasised that apart from these major health hazards, there are many other important health problems like increased incidence of allergies, asthma, high blood pressure, hypothyrodism, reduced fertility, spontaneous abortion etc. Thus on health grounds alone, nuclear energy is to be rejected in absolute terms with little need to base our judgement on the comparative analysis of health hazards of different sources of energy. Any source of energy which threatens the very survival and quality of human species has to be rejected and human society must find a model of development compatible with safe energy sources. During the course of the discussion it became clear that the health hazards of nuclear energy cannot be minimized despite claims to the contrary. Above all, the problem of safe disposal of radioactive waste for thousands of years has yet to be solved.

Today, nuclear energy constitutes only 1% of total electricity produced in India, shutting down of nuclear power plants will thus not result in a crisis on the energy front. The 1% deficit for which the nuclear energy is being produced can easily be overcome by saving electricity losses in transmission.

The MFC meet has also drawn attention to the health hazards of repeated exposure of pregnant women for prolonged periods to visual display terminals (Screens) attached to Computers.

The MFC meet, while affirming the well established immense value of radiological investigations has drawn attention to the fact that additional cancers do in fact occur due to exposure to X- rays. The incidence of additional cancers is extremely low and depends upon the age, sex of the person exposed and the quality of radiological apparatus. It has been estimated that in case of adult male persons exposed to these X-rays, there would be 15 additional cancers per million X-rays. Compared to the number of lives safed and diseases diagnosed this risk is extremely low. But nevertheless it follows that X-rays must be kept to as minimum as necessary and secondly all the precautions necessary to maintain the X-rays units properly have to be meticulously followed. On both these counts the situation in India especially in Taluka places etc., is much worse than in the developed countries. Screening machines are much more hazardous because their exposure is many times more and hence it should be restricted to the absolute minimum. Atomic Energy Regulatory Board must exercise its powers to regulate the quality of radiology units.

War Resisters Meet

The regional conference of the War Resisters India (West) took place at the Sampoorna Kranti Vidyalaya in Vedchhi between 10-13 March 1990. It unanimously adopted the following resolution:

"We the peace activists and constructive workers of the western part of India are deeply concerned about the increasing violence and militarisation in the subcontinent. We firmly believe that it is our responsibility to take such steps that would help in bringing about mutual understanding and peaceful relations between the peoples of this region. Our objective is a world without war, and it is with that spirit that we state the following:

"As the Indian government has repeatedly stated that it is committed to giving priority to friendly relations with her neighbours, we are disturbed to learn now that the Prime Minister has announed an increase in the defense budget whereas the general trend the world over is towards reduction of arms. Therefore, we urge our government to start cutting military expenditure in order to build confidence in South Asia."

"Some recent statements by the government referring to its intention to go to war if necessary as well as the appointment of a defense minister who is a strong protagonist of nuclear weapons are not in keeping with the spirit of the processed policy of reconciliation. This has only served to vitiate the atmosphere in the region.

"We welcome the announcement that at last the Indian troops will now be withdrawn from Sri Lanka and we hope that in future no action will be taken which may be considered a further interference in the affairs of Sri Lanka and for that matter any neighbour country. The future of the people of this region is closely linked with the availibility of water. This should encourage the governments to find amicable solutions to water disputes, for example sharing of Ganga waters between India and Bangla Desh."

"We on our part attach the utmost importance to these issues and are determined to continue our struggle for peace and friendship with our neighbours. We hold that the future of India is linked with the future of her neighbours."

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A Passing Opportunity ?

Energy situation in the GDR and future possibilities

Times are changing rapidly in Eastern Europe. Today, policies regarding the future are no longer decided by a small group of rulers. The people have demanded their rights and soon in all Eastern European countries there will be elections. The tasks of the new governments in the fields of environment and economy will be hard.

The former government of the German Democratic Republic has left an economic and environmental disaster behind it.

In the south of the GDR lie brown coal deposits. It is the only raw material available in the country for energy production. The quarrying of this has destroyed the surrounding area completly. In 36 coal-mining districts 320 Mio tons are quarried per year. That is more than in any other country of the world. The cost to nature and to the population of the area are enormous: 3,000—4,000 ha dead landscape with huge craters is the result of one year's operations alone. 30,000 people have had to resettle, 75 villages have been exterminated, rivers, roads and railroads have had to give way before the gigantic quarrying machines.

70% of the energy supply in the GDR comes from this brown coal. In 16 mainly obsolete power stations more than 80 % of the delivery is burned. But the bigger part of this amount emits through the chimnies and polluts the environment. There are no dustfilters, no installations to cut the sulphur dioxide emissions.

Sebastian Pflugbeil, member of the opposition group "Neues Forum" and a physicist says that three quarter of these power stations should be pulled down because they are in such catastrophically bad repair. He points out that the GDR has the third highest energy consumption per head in the world - a consequence of the old techniques besides the waste of energy everywhere.

So, what to do? The intermediate government had recently made first attempts for a change and reduced the mining of brown coal by about 50-70 Mio tons. But this alone can not be the solution.

In the Federal Republic of Germany the nucleocrats and businessmen of the atomic industry are already on the stage hoping to sell a product which has seemed to be "out" in their own country. In the West it has become more and more difficult to install new atomic power plants: the raised awareness of the population, the opposition movement, the Chernobyl-accident, the increasing costs of this energy resource have all led to a situation where no politician wants to take the risk of ordering new constructions. Now the atomic industry sees its chance in the East. Talks between nuclear experts in the GDR and the West German companies have already taken place.

Today, in the GDR at most 10% of the energy output comes from nuclear plants. Five reactors are on line, four of which are Soviet 440 MW reactors installed at Greifswald. Three others near Stendal are still under construction after 17 years. Recently it has become known that there was a near core meltdown at the new fifth block of Greifswald in November 1989 and a very severe accident in 1976 (see following story).

There has hardly been any resistance against the reactors in the GDR. The pressure from security forces and the ruling party was too strong and the existing environmental groups were faced with more evident abuses: air pollution, dirty rivers and destroyed environment. But if the new elected government decides to extend the nuclear programme there will be probably be more turmoil - the government has to calculate that the times of a quiet citizenry have passed.

It is ironical that just the members of the former government party SED got support of the conservative federal government of West Germany on this issue. In the case of atomic energy the old rulers seem to be the most reliable partners for the western enthusiasts of atomic power.

The common man in East Germany would perhaps prefer some radiation to the terribly bad air but for the environmentalists and most of the opposition groups in the country the choice between the alternatives "brown coal" or "atomic power" is like "the choice between plague and cholera".

The environmentalists have other ideas about future energy politics: they want to overhaul the existing brown coal power stations, improve the industrial and household techniques and put the main emphasis on energy saving possibilities. According to Mr Pflugbeil an extensive energy saving programme is the solution because the opportunities to save energy are more than good. Besides, the brown coal resources are becoming less and less, their quality becomes worse and the quarrying gets more difficult. On the other hand the construction of new nuclear power plants takes a long time (about 10-20 years) - too much time and too much money for an economy in difficulties. The huge expenditures which are necessary for the construction of atomic power plants would divert money from more sensible and urgent activities.

On the 18th of March the first free election in the GDR have taken place. The conservatives have won. This means that the unification of Germany will be quickly forced. Whether the new government with the help of the coservative government in Bonn will be willing to start a reasonable energy policy without nuclear power plants is now again in question. But, the environmentalists too will unite. And they have the better arguments...

Carolin Bender, Bonn, West-Germany

Notice Board

"Safe Energy and Environment"

A new quarterly journal "Safe Energy & Environment" will be coming up from April, 1990.

In Calcutta, a citizen's convention on April 30, 1989, to commemorate the Chernobyl Day, stressed the need for an organised effort for the collection and dissemination of information on the dangers of nuclear power and people's movement against it in particular, and environmental and energy issues in general. The journal 'Safe Energy and Environment' is a step towards the realisation of the demand of the convention. At present, we are working with a handful of activists, greatly limited resources and a tiny network. What we want to make is a modest beginning. The future depends on your active co-operation and support.

Yearly subscription rate:
Personal Rs. 20/ ;   Institutional Rs 40/-

Contact: Pradip Datta,
Publisher Safe Energy & Environment,
28, Nazrul Park, P.O.: Aswininagar,
Calcutta-700059

Trichur Antinuclear Convention

The recent session of the Indian Science Congress has endorsed the demand that two 500 MW nuclear reactors be located in Kerala. There is vigourous campaining canvassing for it in the political arena also. Hence we are organising an anti-nuclear convention in Trichur on 26th April to inform the public and form a strong and united resistance to the proposed project.

Contact: K. Aravindakshan
Walden Post Eravu 680620
Dist: Trichur, Kerala

India's Nuclear Options

27,28 & 29 April Bangalore

The National Front government's budget provide for further increases in allocation for defense and the Department of Atomic Energy.

When tensions are fast disappearing in Europe, in our region the threat of war and momentum towards the building up of large arsenals continues despite glaring poverty and unemployment. The basic priorities are side-stepped due to a misconception of our real security needs.

From time to time there are newspaper reports about exercising the nuclear option - pointing towards the alleged secret weapons programme of Pakistan, while conveniently overlooking the fact that the Minister of State for Defense, Dr. Raja Ramanna along with the present chairman of the Department of Atomic Energy was responsible for the 1974 Indian nuclear explosion.

In August the United Nations will be reviewing the Nuclear Non- Proliferation Treaty. What ought to be India's position on it?

SAARC has become a reality. But the peoples of South Asia are being kept apart - in the interest/defense of their nations.

When most countries with nuclear power as a major part of their energy source are abandoning nuclear energy, India is planning to expand in a massive way. This expansion involves abandonment of long professed goals of self reliance and importing of reactors from Soviet Union and France.

To discuss these and other related issues, it is proposed to hold a three day seminar near Bangalore at the Ecumenical Christian Centre at Whitefield. The seminar which will be residential is being jointly organised by the following organisations:

Documentation & Dissemination Centre for Disarmament Information, Bangalore;
Ecuminical Christian Centre, Whitefield;
Friends Rural Centre, Rasulia, Hoshangabad;
Institute for Development Education, Madras

Contact: Hemachandra Bassappa.
21. Railway Parallel Rd.,
Nehrunagar, Bangalore 560020

Will Koodankulam Be Known as "Chernobyl South"?

On 24th of November 1989, Central Europe stood at the edge of a nuclear disaster comparable to the Chernobyl disaster of 1986. Recently released reports, suppressed by the East German authorities, reveal that a nuclear power plant in Greifswald suffered a near core melt-down.

In order to test the emergency switch-off system of the new fifth block of the reactor, three out of the six cooling water pumps were switched off. Instead of the expected automatic switch-off, the fourth pump broke down and the reactor went out of control. When the crew finally succeeded in switching the reactor off manually, ten fuel elements were damaged - a local meltdown. The triggers to the automatic switch-off were, according to an official investigating commission, sticky contacts of relays which were sloppily constructed, as was the rest of the Russian built reactor.

This accident is only the latest in a series of dangerous and highly dangerous incidents:

In 1974, only hastily spread jumping-sheet prevented some control rods from falling into the fully loaded centre of the reactor.

In the mid seventies all main water pumps broke down. Workers had forgotten to reinstall six small iron lids during a checkup.

In 1981, de-ionized water got into the active zone of the reactor. The speed if the fission reaction increased and the temperature rose out of control.

In 1976, following a fire within the reactor, the complete cooling system of block 1 broke down. Only the coincidence that one of the six emergency cooling pumps was connected to the neighbouring reactor prevented a core meltdown.

The everyday conditions prevailing in the plant present an even more impressive list. The plant was kept connected to the grid under nearly all circumstances. Drunken staff, a leaking and unstable reactor building, paint covered finger-wide welding seams, missing containments, missing replacement and construction materials, chaos in cable connections, sinking foundations and radiation levels 10,000 times in access of design specifications. In order to keep all these skeletons under cover, some 40 people from the Stasi (the dreaded secret police) were posted at Greifswald. Workers and staff were intimidated, while at the same time wages were twice as high as compared to other industries. For decontamination work soldiers were often used. Chromosome damage was discovered in six workers. Workers at the plant were conversant with its obsolete equipment that often broke down. Privately they referred to the plant as "Chernobyl North".

Editors Note: The reactors to be installed at Koodankulam are the very same VVER reactors as at Griefswald.

Reviews

Narora - The Untold Story

We have often lamented the paucity of information regarding the Indian nuclear programme. *Narora — The Untold Story* is an attempt to bridge this great chasm in information. It is published by the Network to Oust Nuclear Energy (NONE)— a group of young activists from Delhi who have made sincere efforts at educating public opinion by conducting slide shows and workshops in a number of colleges in Delhi, Aligarh, Bulandshahar and other towns surrounding Narora. This 24 page booklet contains many pictures of the people displaced by the plant and maps of the surrounding areas. The price at Rs 10 might seem somewhat excessive at first glance but as a small token of one's support for the movement it is indeed a very reasonable price.

Extract

Knowledge of the **plant and of nuclear hazards**

The knowledge the villagers have about the plant is partial and in many cases, distorted. Evidently, Those who bear the brunt of dislocation are not considered important enough to be briefed about the kind of work the plant does. Worse still, they have not been given any information at all about what they are to do in case of an accident.

Some who work in the plant have a clearer idea about nuclear energy. These are also the ones who mention accidents, and incidents of workers being exposed to radiation. We cannot verify these stories since the DAE does not give the public access to such information. However, we have retained reports of such incidents simply to point to the workers' knowledge about the issues involved.

Name: Om Prakash, Village: Ramghat
They told us that electricity generated in the plant releases a poisonous gas. The gas will harm us, our grains will get spoiled, water will get affected, we will die..."

Name: Yadiram, Village: Ramghat
"Buffaloes grazing near the plant had died...

Name: Rambharose, Village: Ramghat
"DM Sahib told us that gas will be released from the plant so we should leave our houses. What type of gas it is we don't know..."

Name: Kalawati, Village: Ramghat
"We were told that our grains will get poisoned, grass will dry up due to the poison, animals, plants all will die... But our cattle still graze near the plant. What to do? There is no other place where they can get anything to eat..."

Name: Kumkum, Age: 10 yrs.,
Colony: Bijaun Nayi Basti
"Our village has been abandoned, that is why we are here. A power house was being made there. When it started working, we would have died. My father told me this."

Name: Unknown (Woman),
Colony: Bijaun Nayi Basti
"They told us that a power house was being built. The electricity will be made from the rays of the sun god. What these rays are we don't know... We were told that if we get exposed to radiation our limbs will be deformed, or our babies will be born deformed. That is why we were settled 3 miles away from the plant..."

Name: Ramwati, Colony: Bijaun Nayi Basti
"We have not been told what we are to do in case of an accident in the plant. They said that if something happens we will be taken out of the area in buses."

Name: Jaisingh, Colony: Bijaun Nayi Basti
"...To make us leave the village they told us that there can be an explosion like Bhopal."

Name: Bankelal, Colony: Bijaun Nayi Basti
"Some men in the plant have got radiated. Pukhraj's whole body is useless. He becomes like a statue and starts shivering."

Name: Unknown, Colony: Ambedkar Basti
"In this plant, electricity will be generated through the eclipse of the sun and the gas which will be produced inside can harm us if it is released."

Name: Unknown (worker at the plant),
Colony: Ambedkar Nagar
"The boiler line taking heavy water to the turbine burst recently. We welded it... The plant was shut down for a month. When the Prime Minister came to inaugurate the plant it was not working... Many workers have died because of radiation. When the contractors get letters from their homes, they reply that these men have left the plant and their accounts have been cleared."

Name: Gulab Singh, Colony: Ambedkar Nagar
"I work in the plant, I do inspection work. When the plant starts, radiation can spread in the nearby areas and the villagers will suffer... because of radiation there can be a loss of blood in the body, pain in arms and legs and if a person gets a large dose of radiation he can die too... There are many labourers In the plant who do not know anything about radiation. .. one man got radiated and as soon as he stood up, he started shivering."

Name: Ranvir Singh, Colony: Ambedkar Nagar
"I have been working in the plant since the past 5 years... About a month before Rajiv Gandhi came here, there was a heavy water leakage. The heavy water was in a tank, which was opened by mistake. When we learnt about the leakage everyone ran away from there...There was no one in the control room...Finally to clear it up, labourers from outside were called in, on daily wages, they were paid around 20 to 25 rupees."

Name: Unknown (worker at plant),
Colony: Ambedkar Nagar
"When someone is exposed to radiation, then if he is normal he is put into hospital, if he is seriously affected he is put behind a glass sheet. If his family comes to see him, they look at him through the glass and come away."

Name: Unknown, Colony: Sundamagar
"We were told that the plant makes papads, and smoke comes out of these. This smoke can damage your eyes."

Name: Mir Kasim (worker at the plant),
Colony: Sundamagar
"The day after Rajiv Gandhi came to start the plant, there was a fire in part of the plant. I was working inside, welding something.. I came away. A friend who was there is in hospital now."

Strategy for Survival

"What is the relevance of a peace movement for India?" This was one of the most challenging questions during the recent regional meeting of the War Resisters of India in Vedchhi. The question was occasionally raised, but more often it was inherent in remarks concerning the priority of work on sustainable energies, organic farming, environmental protection, etc. "We have got so much to struggle within our dialy sphere of work that there is little scope for a national or international peace initiative," was the consensus among some of the activists. Only slowly it became clear that exactly these daily struggles are steps towards a liberating peace.

Towards a Liberating Peace is also the title of a new book trying to provide a "coherent shared theory which illuminates hidden intolinkages in dear and understandable terms." An international team of scholars under the direction of social scientist Rajni Kothari and within the framework of the United Nations University's Programme on Peace and Global Transformation has prepared the study. It focusses on the issues of militarisation, worldwide economic cirisis, conflicts over resources and human and cultural rights.

It is interesting to read the publication and to know more than the authors possibly could have known: The group's work was completed in 1989 and only the last months' developments have opened new perspectives on the dynamics of world history. Much of what is said in *Liberating Peace* anticipates the recent developments, for example the strong influence which consumerism exerts on non-Western societies, or the impossibility of maintaining economic and political independence in the neighbourhood of a superpower (see Nicaragua).

Other hopes for tendencies in favour of sustainable and peace promoting life styles have been disappointed, as for instance the defeat into near irrelevance of the ecologically and socially conscious dissidents in East Germany's polls or the rising conservatism and chauvinism in Europe and South Asia. The political and economic failure of the socialist systems, which the authors recommend as positive solutions to some aspects of the economic crisis, makes the reader doubt the assessment. But it is easy to know better now.

The book at times, reminds one of the style of the Brandt report: long enumeration of global problems and lists of recommendations for a reorientation. Here the critical reader will not find much new information.

But the authors do more than that when they show how militarisation is one cause behind the distortion of the economy as well as of the political process. An elite which has accepted violence as a means to defend its way of life, would prefer to alot government funds to research and production relevant to the military not regarding their long term destructiveness. A large military apparatus, nuclear weapons and arms industry even in peace times breed secrecy and curtailment of civil and democratric liberties.

The authors demand a global reduction of military spending and arms production as the only way to counter the economic and ecological crisis. They point out that the North only can produce new weapon systems because the South buys its products and thus contributes to the market feasibility of the industry. However, one wishes that they also had discussed the contribution to the arme bazaar of countries like India, Argentina or South Korea.

Prof. Kothari's well-known pen is felt throughout the book: issues of peace and global transformation are analysed in relation to the role of the State. The nationalist State is denounced and hope is sought from efforts at the grassroots. If the movements give up their regional and national isolation they would be able to develop strategies for a transformation of the State. *Liberating Peace* is meant for them and hopefully would stimulate the discussion about the critical movement's role in politics and society.

Rajni Kothari, Richard Falk, Mary Kaldor, Lim Teck Ghee et al.

Towards a Liberating Peace

New Delhi: Lokvani: Tokyo :

The United Nations University 1989

LETTER BOX

There are just a few general remarks I would like to make about Anumukti. Of course the magazine is informative. The piece on the French nuclear programme was one such. But there are finer, more intangible reasons that speak for Anumukti. After all information can be gathered from other sources too.

Magazines like Anumukti are precious fragile things that need all the care that humanity is capable of mustering, to be bestowed on them. Anumukti's battle is a losing battle. I don't think that any government in the world either cares or dares to uphold environmentalism or denuclearisation against the claims of industry and capital, aided as both are by science. This combine is ruthless and invincible I think, and it is going to see to it that it remains invincible. Power after all has never been given up for idealist or ideological considerations.

But every doomed battle represents a worthy cause. In today's world environmentalism has the only rhetoric that makes sense. All the known causes - culture, religion, nationalism, communism, feminism etc. -- are based on exclusiveness of one kind or another - geographical, territorial, sectional and so on. This kind of exclusiveness has become out of date in today's world of time-compressing locomotion.

Environmentalism has no totems. It upholds the biological foundation of life, in which every division brought about by man-made civilizations and cultures, disappears. We need this sweep of vision today, and the breadth and spaciousness it spells, to regain the wholeness taken from us by exploitative and undisciplined technological growth.

It is unlikely, as I said, that this vision and spaciousness will be given for the asking, or that they would pass into unconcious and established ways of thought and being or that they would ever be anything more than concepts. But that is precisely why Anumukti and magazines like it have to be supported. The saying of unrealizable truths is important. I would like to be amongst those who at least clap for the sayers even if they can't be sayers themselves.

Raji Narasimhan
B107 Gulmohur Park, New Delhi 110049

In the last issue of PPST Bulletin, there was a long article indicating that the Indian nuclear energy programme was costly, inefficient and made no provision for the disposal of wastes. I had sent this article to a friend of mine in the United States and he disagrees strongly with this view. (His comments are enclosed)

As you know this is a very disputed matter and it is not easy to understand, why when nuclear energy can save fossil fuel and is yet being followed all the world over, India should take a stand against its introduction and continuance. The late Sir Homi Bhabha, and our scientists like Dr Raja Ramanna and Dr Srinivasan also hold the same view. Perhaps you might like to consider all these facts and not take a completely one sided view of this disputed matter.

R.K.Patil
Civil Lines, Nagpur

I am from Kutch. Kutch is in comparison to other parts of Gujarat a very dry and thirsty area. To such an arid land the gift of water would indeed be a great blessing.

But our tiny planet Earth has suffered much from the depradations of the pleasure-seeking 'developers'. They have polluted entire creation and are still continuing to do so today. Any attempt to halt this plunder is welcome and those who raise their voice are only performing their sacred duty.

There can be honest differences of opinion on issues but amongst those who protest this terrible disbalancing of the harmony of nature there are many who are honest and pro-humanity. I myself personally know some of them.

I believe that seeing the high level of feeling raised on this issue let the dam be built and whatever be the outcome we shall share the benefits and the harm equally.

But those farmers who shall be receiving water from the dam, why cannot the rich amongst them share half their land for those who are being displaced by the dam? It is only in this atmosphere of sacrifice that the passions of the protestors can be calmed.

The waters of the Narmada belong to the nation. It is only when their distribution is on the basis of social justice that a new and healthy atmosphere can be built up.

It is only when we (the supporters of Sardar Sarovar) can listen with respect and an open mind to the opponents, that the passions of 'WAR' can be converted and the Narmada Abhiyan can become a new beginning.

(Translated from Gujarati)
Manibhai Sanghavi,
Shri Gram Swaraj Sadaneelpar, Kutch 370165

Subscription Rates:

Rs.25/-per year South Asia

U.S.$ 15/-per year air mail overseas
(Rs.2007-per year if paid for in India)

Please add Rs.6 for cheques

Editor: Surendra Gadekar

Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to

Editor Anumukti,
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat Printery, Ahmedabad.

PRINTED MATTER BOOK POST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Volume 3 Number 4 **February 1990**

Aradhana Padhye, an avid *Anumukti* reader, is an old student of mine. For the past one year she has been working in a village called Mangrol, near Rajpipla in the Bharuch district of Gujarat. Recently she wrote me a letter seeking help in resolving a problem she faced in her work.

Cans of EEC donated butter-oil have made their way to Mangrol under the Integrated Child Development Scheme (ICDS). The scheme provides dietary supplement to young children. Having read stories ("Utterly Gutterly Butter" - *Anumukti* Vol.1 No. 5) regarding EEC dumping of Chernobyl contaminated food in the Third World, she was loath to give the butter-oil to children in her charge without first knowing how contaminated it was. She wanted to find out if anybody could analyse a sample from the can and tell her the radioactivity of the contents.

The letter left me at a loss. The only people I know who can do this sort of analysis are scientists of the Bhabha Atomic Research Centre. Unfortunately, nobody can believe a word of what they say since their credibility in matters atomic is close to zero. It is sad but nevertheless true that in today's India an ordinary citizen cannot place trust in the veracity of public- supported scientists especially when their own sectarian interest is at stake. And it is a further shame that nuclear overlords have so managed matters that they and they alone have the capacity to provide information. Rely on us, they say - faithfully or unfaithfully as the case might be, but rely on us you must for there is no other alternative.

But cursing this sorry state of affairs does not help Aradhana. A partial, somewhat unsatisfactory solution is at hand. Ironically a 'foreign' hand. A group in Japan has proposed the establishment of a global network of citizens' groups monitoring radioactive contamination. They became interested in the subject following reports of import into Japan of contaminated powdered milk as animal feed. Their research has revealed that highly contaminated non-fat dry milk which cannot be used in food and is therefore dead stock, is being cleverly strewn around the world. Members of the group feel that it is important to deal with the problem not only in Japan but throughout the world. They propose to make their equipment and expertise available to Third World groups lacking monitoring equipment. Anyone worried about the quality of imported milk products can send them samples for analysis.

So far so good. But is it a solution? ICDS probably covers thousands of villages and millions of children. If Japanese fears regarding the scale of dumping by EEC 'aid'-givers are justified, then we in India, the biggest recipient of this largesse are in big trouble. Instead of child development, what ICDS is achieving is integrated destruction of children's health. It is a frightening prospect. The only protection against this atrocity, would be strict and vigorous monitoring. The need for monitoring is obviously great. It needs both government and voluntary effort. Groups of young scientists need to explore ways in which their expertise and equipment can be pooled to give help. The third largest pool of scientific manpower needs to bestir itself and become useful to the people of India

But even a large swadeshi network of scientists independently monitoring food imports is in the final analysis no "solution at aft. The only reat solution is to get out of this heft where millions of our children have to depend for their basic nutritional needs on the tender mercies of foreign aid donors. But doing that would mean standing on our own two feet and that is never easy for people who have become accustomed to crutches.

Goodbye Sanity

Actions speak louder than words. Some actions positively shout. The appointments of Dr. Raja Ramanna and previously of Dr. M.G.K. Menon as ministers in the Central Cabinet are examples of such actions. The Prime Minister has sent a dear signal to all regarding the competance, The openness and the future intentions of the government. One ought indeed to be thankful to him for having so quickly dispelled illusions regarding the shape of things to come.

If one person was to be chosen as a symbol of all that is rotten in Indian Science, one would not have to look farther than Dr. Raja Ramanna. His tenure as the Chairman of the Department of Atomic Energy and the controller of the lion's share of India's research funds was marked by four main features :

* The total divorce of scientific enterprise from addressing the real needs of the people.

* A 'darbari' style of functioning which lead to the proliferation of cliques and quickly turned bright young researchers into masters of sycophancy and intrigue.

* An arrogant contempt for criticism where all critics could only be considered as traitors and fools.

* Above all, mounnental non-performance. The sorry state of India's atomic energy programme is a tribute to his efficiency.

By resurrecting such a person from well deserved super-annuation, the Prime Minister has sent the following messages regarding his own administration.

* The government believes itself to be incapable of the ruling the country and needs 'experts' to do so. At the same it does not have the discrimination to choose the right experts.

* Despite all talk of freedom of information, the right to know, the duty to inform, blah, blah the government intends to continue its secret ways hiding behind acts such as the Atomic Energy Act of 1962 and the Official Secrets Act.

* While reassuring neighbours of its 'peaceful' intentions, the government intends to proceed full speed ahead with developing nuclear bombs, inter-continental missiles, nuclear powered submarines and all such paraphrenalia of a mini-superpower.

The more things change, the more they remain the same.

Surendra Gadekar

Independent Monitoring in France

The government monopoly of information on radiation is at last breaking up in France. One force behind this development is CRII-Rad (the Commission de Recherche d'Information Independante sur Ia Radio-activite), an independent monitoring organization founded in 1986 after it became clear just how unwilling French authorities were to give information on ionizing radiation following the Chernobyl disaster. (Vital information about the accident was given out three months afterwards, long after measures to reduce the amount of radionuclides entering the food chain should have been taken.)

Initially, the two main goals of CRII-Rad were to carry out research on ionizing radiation and its impact on vegetation, soil, water, etc. (this includes using a laboratory for analysis), and making the results of its research accessible. Since starting up, the group's qualities as an alterative source of information has steadily received acknowledgement and its.activities have increased.

An important project of CRII-Rad is the establishment of a monitoring network meant to create the possibility for shared, reliable information on air quality. The idea is to have monitoring facilities financed by local authorities on the municipal and regional levels. CRII-Rad has had some success in this effort. At the request of the Regional Council of the Alsace, a monitoring point and center for evaluation has already been set up and, by 1990, three more monitoring points, including one at Tam-et-Garonne, will be completed. It is further hoped that monitoring centers outside France will extend the network.

Source: *Wise News Communique 322*

High Hazards at Low Levels

Robert Roentgens discovery of the X-rays in 1895 has drastically changed the course of medical diagnosis. Radiology has made the detection of many pathological processes possible, which would have remained undetected by pure clinical examination. But in contrast to the advantages of X-rays, there has also been mounting evidence right from the early years of the 20th century of the hazardous effects of extensive use of radiology on human health.

The effects of high doses of radiation have been observed in a large number of animal studies. The fact that radiation in high doses can cause infertility, pancytopenia and death, has been common knowledge for a long time. But very little was known about the details of the mechanism of interaction of ionizing radiation wih biological tissue. This lack of knowledge coupled with the enthusiasm of the pioneers for the wonders of the new technology, led to careless ways of dealing with radiation. Unfortunately this sorry state of affairs still persists.

Today there is no doubt at all about the damaging effects of radiation at whatever dose and on any type of biological tissue. Various physical, radiochemical and biological aspects of the mechanisms of the interaction of radiation with biological systems have been extensively studied in the last decades.

Investigators in Ohio have found a variety of genetic deformities and abnormal growth patterns around the Fernald nuclear facility. Fernald, a town 18 miles northwest of Cincinnati, Ohio is host to the Feed Materials Production Centre where uranium is converted into metal form for use as fuel in military nuclear reactors. The problems include: low birth rates and slowed growth in birds; significantly fewer species of underwater organisms and genetic differences in fish and invertebrates downstream from Fernald, compared with upstream; and between 32% and 43% fewer plant species than in comparable areas away from the plant.

These mechanisms are the following:

1) Direct interaction of the ionizing particle or track with structures like the cell membrane, or with macromolecules like proteins, lipids or DNA resulting in breakage and loss of function. This type of damage is caused by radiation with high linear energy transfer like a-rays, neutrons and b-rays. This effect is random and strongly dose dependent.

2) Indirect damage caused by the induction offree radicals like OH* and O* which react with biological structures and macromolecules. Several microenvironmental factors influence the formation of these free radicals. High temperatures and high oxygen partial pressure increases the formation of these radicals whereas the presence of radical "scavengers" like cystein or manitol reduce their formation. The dose response curve for damage caused by radical formation flattens out at high dosage because at high concentrations the radicals begin interacting amongst themselves.

3) Non specific effects:- These result due to changes in the activity of enzymes, shifting of electrolyte balance, changes in pH levels and the general altering of' the micromileau within the cells These changes can trigger the cancer causing oncogenes residing within the nucleus of the cell. Till now these changes could not be quantitatively correlated with radiation dosage since the detection methods were inadequate to determine minimal changes. Till very recently, such effects were not studied since the studies being conducted were survival experiments which determined the point-of-no-return damage. These indirect effects were taking place much below this level and have hence remained undetected.

Now with the availability of new techniques to measure biochemical changes, it is these very non-specific effects of radiation that are considered responsible for changes in the immune system. These changes range from increased susceptibility to infection right up to cancer induction. These effects include growth retardation, mental deficiency as well as infertility. These indirect non-specific effects are caused mainly by X-rays and r-rays and can occur even at the lowest of doses.

Besides finding out about the mechanism of radiation induced changes, experimentalists have also been concerned with quantitative measurements of dose-response relationships. The information obtained from the survival studies carried out in the past, has of course very limited validity in the low-dose region and is therefore of no use in estimating hazards in the low dose sphere. Nevertheless, results obtained at higher doses were simply extrapolated to the low dose range, assuming linearity in the dose-response relationships. Below a certain threshold, it was assumed that there would be no damage at all due to the repair mechanism of the living cell.

In fact, the absence of a radiation threhold has been proved many times. There is also no evidence for a threshold in the susceptibility of the repair system. At least for the DNAsingle strand break it was recently shown that while very small amounts of radiation can cause damage, they may not induce repair activities. So, radiation induced breakage remained unrepaired causing chromosome aberrations following mitosis.

Thus, although extrapolation of results from high to low dose regime assuming linearity and a threshold were scientifically not convincing, they were convenient for nuclear industry needs during its early phase. They provided a cloak of scientific respectability and allowed politicians to declare certain radiation doses as harmless.

The main conclusions may be summarised as follows:

1) There is no threshold for radiation damage in humans.
2) Dose response is dependent on the kind of radiation but tends to be higher than expected for smaller doses.
3) The mechanisms involved in the induction of cancer and mutagenesis in the low-dose regime seem to be indirect rather than direct and may be non-specific upto an unknown amount.
4) The human organism is incapable of repairing the low-dose induced damage properly.

To estimate radiation damage at any stage we have to look at different factors such as increased proneness to interoccurring diseases such as anaemia and genetic syndromes like for example Fanconi s syndrome, the young age of patients and others. The highest amount of damage is probably induced in the growing fetus in utero during pregnancy. Let us examine this damage in some detail.

First of all the kind of damage expected to occur in the baby depends on the stage of the pregnancy. Generally it is believed that any chromosomal or whatever damage induced in the first 10- 21 days leads to abortion. However there are some exceptions such as the Trisomy syndromes (e.g. Down's,) though only a very small percentage of them reach term. Actually there are chromosomal aberrations found in some 70% of aborted fetuses. Severe malformations like anencephalis, Cyclopes etc. are induced by damage up to 10 weeks of gestation.

After the stage of organ formation, induced malformations get rare. One would rather expect unspecific damage, leadingeventually to enzyme defects and disorders of the immune system.

Induction of leukemia is also believed to take place in the third trimester. Radiation influences the development of the brain of the fetus/embryo in every stage of pregnancy up to term. The mechanism of this process is the disturbance of mature neuronal cells' migration from the central regions towards the peripheral cortex. While the neuralglia-cells' matrix is nearly organised by some 20 weeks, migration of the neurones goes on until delivery or even later.

According to a study published in Japan in January 1989, workers in nuclear power plants have double the normal level of chromosome abnormalities. The study was conducted by Dr. J. Muramoto of the Environmental Medicine Research Institute.

The 115 workers examined were all men, ages 20 to 61, whose length of employment ranged from four months to 12 years. Cumulative exposure levels as measured by film badges were as follows: less than 1 rem (10%); 1to 5 rems (44%); 5 to 10 rems (33%); more than 10 rems (13%), the highest exposure was 14.3 rems.

A total of 93,505 lymphocyte cells from the blood of these workers were analyzed for chromosome abnormalities. It was found that the incidence of chromosomes with two chromomers and ring - shaped chromosomes was 0.22% compared to 0.12% among local residents. Another finding was that the number of abnormally shaped chromosomes were was proportionate to the level of radiation exposure.

Source: *Nuke Info Tokyo, Mar/Apr 1989*

Glossary of Medical Terms

Anencephalis:- A child born without development of brain.

Chromomers :- One of the serially aligned chromatin granules forming the chromosomes

Chromosomes:- Thread like structures in the cell nuclei, which cany genetic information and are responsible for hereditary characteristics

Cyclopes:- severely malformed child bom with one eye, like the giant in greek mythology.

Cystein :- Aminoacid; guards liver from toxic material

Down syndrome:- A type of mental retardation caused by a chromosonal abnormality, giving rise to certain characteristic physical features, notably an oblique slant of the eyes.

Fanconi s Syndrome :- Complex multiple defects in kidney function caused by genetic disorders in the kidney structure

Leukemia :- cancer of the white blood corpuscles in the blood.

Leukopenia:- Marked reduction in the number of White Blood Cells.

Lipids :- Commonly known as fats and oils

Macromolecules :- Large molecules like fats, proteins etc.

Manitol:- An organic alcohol which guards liver from toxic material.

Mitosis :- A type of cell division in which the number of chromospmes remain the same in daughter cells.

Mutagenesis :- Any heritable alteration of the genes or chromosomes of an organism.

Neuralglia-cells :- Primitive nerve cells

Oncogenes :- cancer producing genes.

Opportunistic infection:- Infection caused by a pathogen that can cause disease only in a host with lowered resistance

Pan-cytopenia :- Reduction in the number of blood cells of all types.

Trisomy :- A genetic disorder where one chromosome is represented three times in an otherwise diploid set.

Epidemilogically investigators have found significantly lowerschool performance from children who were irradiated in utero during atomic bomb testing in Nevada, the Three Mile Island Nuclear accident and at Hiroshima.

Radiation Induced childhood leukemia has been observed in the vicinity of several nuclear plants. First and probably the worst of all is Sellafield (formerly Windscale) in West Cumbria, U.K. Rates there have been ten times higher than the British averages. Other spots are Dounreay in Scotland and Aldermaston and Burghfield. Elevated childhood leukemia rates have also been reported from Yugoslavia and Idaho Fall in U.S.A. as well. Even in Germany, despite claims of running the worlds safest reactors, recently published epidemiological surveys provide evidence of increased childhood leukemia around nuclear installations.

Tragically and somewhat ironically, the nuclear disaster at Chernobyl in April 1986 has provided scientists with an oportunity to study in depth the effects of low dose radiation. The average population dose in Germany was within the range of 150 - 250 mrem during the first year. However, already some acute effects have been observed. The incidence of Down's Syndrome was raised 5 fold above the average in West Berlin in January 1987 correlated to the mothers' estimated date of conception having been during the days of the main fallout in May 1986. To add further proof to the findings, a survey on the incidence of Downs Syndrome was conducted all over Germany. It duplicated the fallout-dose-pattern showing for example the highest increase in Bavaria which received the largest fallout.

In U.S.A. Prof. Sternglass has reported an increase in infant mortality and death from causes such as opportunistic infections and AIDS during May 1986. Discussing the epidemiological data he pointed out that the common cause of death among these groups could have been an acute drop in leukocytes which led to the deterioration of pre-existing diseases. Actually a short-time temporary leukopenia after low-dose irradiation has been reported several times already even in healthy people. This has frightening implications for Europe if one considers that the Chernobyl fallout in the U.S.A. was just 1% of the European average amount.

Anyway, Robert Rontgen's and Marie Curie's days of relatively careless handling of radiation are gone. Both died of leukemia. Health professionals need to be especially concerned. They account for some 80% of the man-made radiation exposures.

Wolfgang Hoffmann
Bonn, Germany

The Real Scar is Within

I am Millie Smith. I was born and raised in Pasco, Washington, several miles downstream from the Hanford Plant, residing there from 1947 to 1967. I am one of the 20,000 children that the Center for Disease Control believes have been exposed to the secret radioactive releases of Hanford, which have been reported to be among the world's largest. Not only did our government fail to warn us and take safety precautions, but the releases were kept secret for 40 years.

If the releases hadn't been made public when they were in 1986 through the Freedom of Information Act, I likely wouldn't be alive today. After years of weakness and poor health, going from doctor to doctor getting no answers, I was finally checked for and discovered to have metastasized thyroid cancer only after the knowledge of the releases. That discovery was on December 23, 1986; and the following day, Christmas Eve, I was told that I had less hope. The five hour delicate surgery on January 23rd, 1987 revealed extensive cancer throughout my neck, jugular vein, laryngeal nerve, trachea, along my oesophagus, in between my lungs and throughout my upper right chest. Two of my parathyroids were removed; they regulate calcium and their deficiency can be life threatening, affecting the heart and causing permanent brain damage. I experienced a deficiency temporarily after surgery but that was brought back under control.

My doctor said that I could have had this cancer for 20 years as it is usually slow growing. If thyroid cancer is detected at an early stage it is usually easy to treat - but since mine was extensive, my doctor said that it will be difficult to cure; and I have a high risk of reoccurences and more surgeries. Following surgery, I was bedridden for almost a year and have relied on chore services for the last two years, I experienced severe short term memory loss and lack of concentration. One of my vocal cords was temporarily paralyzed.

In November 1987, a reoccurence of a malignant tumour was discovered in my neck and I was treated with radioactive iodine- 131. I took a smaller dose to avoid isolation in the hospital. I was told that my urine would be radioactive for three days, that I shouldn't kiss anyone and stay away from babies. I was also told that those treatments would increase my risk of leukemia. Following treatment I experienced nausea and for the next few months chunks of my hair fell out and I had skin eruptions

Right now I am better than I was a year ago but still I am waiting to see whether my condition will progress or worsen. I am still very weak and have fluctuating memory trouble and slowness of thought. I have to take thyroid medication for the rest of my life as I'm unable to live without it. I still have no prognosis. I can't but help wonder if I have any more undetected illnesses.

Since my surgery, I have been trying to find as much information as possible about radiation effects and what happened to us. The more I've learned, the stronger my belief has been that my health problems are due to Hanford releases. Last summer I was told by Japanese radiation specialists that my health history since early childhood is almost identical to their radiation victims.

My history includes great susceptibility to infection and illness, lethargy and weakness, low physical capacity, frequent dizzyness, nausea and vomiting, frequent heavy nose bleeds and pains in my arms and legs. I remember especially experiencing nausea and a bad taste after drinking milk. At the age of 9, I was tested to be at high school level academically, yet by the time I was in high school, my mental process slowed down. In 1964 hypothyroidism was discovered and I was placed on thyroid medicine temporarily. Birth defects in my reproductive organs were also discovered, requiring minor surgery and hormonal treatments.

In 1980, mild spinal defects were discovered a mild spina bifida and deformity of vertebrae in my neck. I have had menstrual abnormalities and have suffered three miscarriages.

I have been unable to work. Before my cancer discovery, I felt I was 80 years old. My life has been a struggle of hardships and setbacks that many other Hanford downwinders face. I have a permanent scar that you see around my neck - yet my real scar is invisible. Due to my health problems I have lived in poverty most of my life. There have been times when all I had to eat was rice and popcorn for months. There were many winters of having to go without heat; there were times I was homeless for although I had money for rent, no one would rent to me as I didn't have a job. Presently I don't have enough money for bills and the needs of my daughter.

We had to go to food banks and the Salvation Army. I don't have money needed for nutrition. Yet, I am just one of the many whose lives have been damaged. My mother told me that almost everyone she knew around Hanford area had at least one person in their family with thyroid cancer. My family doctor has stated that he treats too many thyroid disorders in the area. My mother and many of my old neighbours have severe lung problems. My sister has had skin cancer and birth defects. Two aunts and five cousins have had cancer. I have heard people in the area remark how somebody is either having leukemia, brain tumours or cancer. I remember two close friends and two other classmates who died of cancer while still in high school. After doing a health survey of my former classmates, I learnt of more cancer deaths and multiple health problems. On family land next to Hanford, 24 of the 28 families have been afflicted with cancer, thyroid problems and serious birth defects such as no eyes, no skull, no hips. More and more stories keep emerging. I just recently learnt of a woman who lost ten babies.

There is no doubt in my mind that we have been affected by the Hanfor holocaust. The government denies any effect of the releases and demands proof. We feel that they should prove our illnesses arn't due to radiation. Scientists have estimated that residents near Hanford received ten times more radiation than people at Chernobyl. How can anyone deny that we have been affected?

I believe that we have also been affected in other subtle ways, possibly causing damage to our immune systems. It has been stated that no two persons will experience the same injury from radiation and neither will any molecule or cell. So how can we really know the extent of our damage?

It doesn't take an expert to see that our land and people have been contaminated. The government's failure has been alarming all over the country. Our country, I fear is on a path of suicidal destruction, killing its own people in the name of "defense" and "national security." Yet we have no security, our bodies have no defense. We are as abused children, victims of our own country. We can have all the weapons in the world - yet we cannot be a strong country unless we are strong within.

I came here to tell my story in hopes that with more public knowledge, action will be taken to prevent further contamination and that we will be helped. Not only does the government refuse to acknowledge us and take responsibility for their actions or compensate us - they just keep ignoring us. The claims that we have filed have been denied, and we are not allowed to sue. Many still do not know of the releases.

We from the Hanford area want recognition as the Hanford hibakusha - atomic bomb survivors as are the Japanese. We also want an apology from our government. We want and need a radiation research and medical center and hospital where we can get immediate free health care by radiation specialists as they have in Japan. We also need a toll-free number where downwinders can get accurate information. We want to know the full truth of what happened to us. We want the government to be accountable for its actions. We want justice.

Two years ago, I was fighting for my life; today I am fighting for the life of all of us and for the life of our land. I would like to quote from a great Indian leader who speaks for the heart of the Indian nation on his message to our government over 100 years ago. Unfortunately, his wisdom went unheeded. They too were betrayed by our government and became victims in their own country.

"If we sell you our land you must remember it is sacred. We are part of the earth and it is part of us. If we sell you our land you must remember that he air is precious - that the air shares its spirit with all the life it supports. The wind must also give our children the spirit of life. If we sell you our land you must keep it sacred."

The earth is our mother; whatever befalls the earth befalls the sons of the earth. The earth does not belong to man - man belongs to earth. All are connected. Man did not weave the web of life - he is merely a strand; whatever he does to the web he does to himself. Continue to contaminate your bed and you will one night suffocate in your own waste. If we sell you our land - love it as we have loved it - care for it as we have-preserve it for your children."

I ask you - what legacy do we have for our children? We downwinders have been exposed to the wind of death. I hope our future genertions would have life.

From testimony given before the U.S. Congress

Source : *The Hanford Journal, number 8 spring 1989*

In the Face of Uncertainty

A report on radiation safety standards

Radiation's history teaches us many lessons. Certainly one of the most important onecentres on the humankind's passion for leaping without looking. We have been plunging forward in the name of technological advancement without a great deal of concern for the consequences of 'progress'.

The Promise of Things to Come

It has been said many times and in many ways that those who do not learn the lessons of history are destined to repeat its mistakes. History assists us to understand where we have come from and can shed light on our future directions. In the field of radiation an eagerness to exploit new discoveries has created a myriad of problems. The situation is of course not unique to radiation. Other examples of the same tendency are the use of the tranquilizer thalidomide, the fibrous mineral, asbestos and the refrigerants CFC's.

The advent of X-rays in 1895 was soon followed by the knowledge that radiation can cause injury. By June 1896, X-ray injuries had already been recorded. By 1903 attention was also drawn to the dangers of scattered radiation in radiographic rooms. Despite these early warnings, X-rays continued to be used with wild abandon. Not only were X-rays used as a diagnostic aid, but also as a therapeutic measure for a veritable host of disorders ranging from inflamed tonsils to whooping cough as well as all kinds of cancers.

Unfortunately, in at least some instances, the 'treatments' produced effects more severe than the original complaint. One case in point involved the use of X-rays by a U.S. doctor to remove unwanted hair from his secretary's armpits. His 'treatment' led to burns and eventually to amputation of both the woman's arms.

Whilst many of the gross excesses linked with the use of X-rays occurred in the early part of this century, recent reports indicate that deleterious health effects are still occurring through over-exposure of patients and technicians. A 1983 WHO report states that "throughout the world there is overuse of diagnostic radiology..."

Medical profession also adopted radium as a therapeutic agent in the belief that it possessed healing properties. Until the 1930s thousands of people in the U.S. actually ate and drank preparations containing radium under the ilkisaion that "radium has absolutely no toxic effects, it being accepted as harmoniously by the human system as sunlight is by the plant." The injection with radium of children suffering tuberculosis was only stopped in 1951 when it became obvious that it was completely ineffective. Yet by this time the carcinogenic properties of radium had long been known.

With the advent of the atomic bomb and the subsequent use of atomic energy for electricity generation, the number of radiation deaths multiplied. Rosalie Bertell, in her book *"No Immediate Danger"* estimates that the "global victims of radiation pollution conservatively number 13 million to the year 2000."

Unfortunately, it is impossible to establish with certainty, cause and effect regarding the onset of cancer in any one individual. This is because a person may be exposed to several carcinogenic hazards during her/his lifetime, any one of which could induce cancer. Though what is well established is the fact that the greater the collective dose of radiation the larger the number of resulting cancers in the exposed population. The situation is similar to playing Russian roulette. A single bullet loaded in a revolver barrel will eventually lead to someone being shot - we are simply unable to say who it will be.

In the Face of Uncertainty

One of George Orwell's most significant contributions as a writer was to foresee and demonstrate how the English language could be used in ways which belied common understandings.

It would be convenient and reassuring to understand safety standards as levels of exposure to radiation which cause no harm, danger or risk to human beings. This is however not the case. Perhaps, early in this century, those given the responsibility of establishing radiation standards thought them safe. This is certainly no longer true. The term has persisted but the meaning has changed.

Safety standards are now defined as determining 'acceptable' risk for workers and the general public. Whilst it is possible to quantify risk, it is much more difficult to reach conclusions regarding acceptability of any particular level of risk. Against what benefits do we assess risk? And more importantly, who is to make the value judgement? Those bearing the risk? Those reaping the benefit? An Independent' body ?

Radiation protection standards were first formally issued by the German Roentgen Society in 1913. However, it was only in 1934 that the International X-ray and Radium Protection Commission first adopted the concept of a tolerance dose - believed to be a dose below which no harmful effects would occur. The tolerance dose was fixed to be "about 0.2 roentgens per day. However, at the very time, this limit was adopted by the international committee, the U.S. committee had agreed upon half this dose as the tolerance dose. Many U.S. geneticists then believed that even this lower limit was too high if genetic effects were taken into account. Characteristically, their response was to agree to a change in terminology. Tolerance dose became permissible dose Although it is doubtful if the change was successful in conveying to the radiation worker that a permissible dose was not to be considered entirely harmless.

The Swedish National Institute for Radiological Protection (SSI) has promulgated new radiation standards that will take effect in 1990. The new standards are the result of a new law which came into effect July 1st, 1988. Earlier Sweden was following the standards recommended by ICRP. The maximum allowed lifetime exposure to a radiation worker will be 700 millisieverts (mSv), which in practice means an annual dose of 15 mSv/year, based on a 45-year working life between 20 and 65 years of age. The present standard is 50 mSv/year with no lifetime dose limit. SSI has also made a rule that at 30 years of age the cumulative exposure must not exceed 180 mSv. The maximum allowed exposure to a pregnant woman will be 5 mSv during the pregnancy period. Further, she now has the right to request temporary transfer to a radiation free environment.

The move away from a tolerance dose was the first major shift involving the principles of radiation protection. The shift was accelerated after the formation of the International Council for Radiological Protection (ICRP) in 1950. In 1954, ICRP acknowledged that "since no radiation level higher than the background can be regarded as absolutely 'safe', the problem is to choose a practical level that, in the light of present knowledge involves negligible risk."

A further revision was adopted in 1958 and published as *ICRP Publication 1.* In this document a reduced maximum permissible dose of 5 rems/year was recommended for workers (0.5 rem for he general public). This standard has remained unchanged ever since.

Interestingly, the ICRP assumed responsibility for defining what exposures were to be considered acceptable stating "the permissible dose for an individual is that dose, accumulated over a long period of time or resulting from a single exposure, which in the light of present knowledge, carries a negligible probability of severe somatic or genetic injuries; furthermore, it is such a dose that any effects that ensue more frequently are limited to those of a minor nature that would not be considered unacceptable by the exposed individual and by competent medical authorities."

Having accepted that all exposure to radiation imposes risk on those exposed, the ICRP recommended in 1966 that "any unnecessary exposure be avoided." It also adopted the ALARA principle stating "that all doses be kept as low as readily achievable, economic and social considerations being taken into account. The significance of this move was considerable. The difficulty of defining what was 'readily achievable, economic and social considerations being taken into account' created additional problems.

Whilst authorities concerned with radiation safety have been prepared to follow ICRP's recommendations, it is important not to accept ICRP's pronouncements without question.

The main reason for scepticism is the fact that the data on which ICRP's recommendations are based concern the victims of atomic bombardment of Hiroshima and Nagasaki and this data has been under wholesale review. (See Anumukti Vol.1 No.3 -"Radiating Complacency" and also the box on this page)

Recent reevaluation of the Hiroshima-Nagasaki data indicates that the risk estimates of the ICRP for radiation toxicity are far too low and are indeed grossly misleading.

When Safe's Not Safe Enough

The philosophical foundation underlying nuclear enterprise are the tenets of Utilitarianism propounded by Jeremy Bentham and John Stuart Mill. They posit "as the moral goal of all human actions, the greatest possible balance of good over bad for mankind as a whole." Somebody has to pay the price for 'progress' but the society as a whole has a net benefit. Let us take a quick look at who has to pay the price and for whose benefit.

Usually, those who bear the most risk are precisely those who receive the least benefit. They include :

The workers - It may perhaps be argued that the workers by their willingness to engage in certain occupations willingly accept the associated risks. This is questionable since the hazards faced by the workers are down-played. The danger of uranium mining had been known for a hundred years before mining in a concerted fashion began in 1945. Yet it took the United States Congress until 1967, with many resultant miner deaths from lung cancer, to legislate for mine ventilation. Workers are reminded that exposures are within 'permissible limits' recommended by international safety authorities which mitigates against any real notion of danger and therefore knowing consent to that danger.

The poor - who cannot exercise the choice of moving far away when nuclear facilities are built without so much as a by-your-leave in their vicinity.

Pregnant women and developing infants - who are particularly vulnerable to radiation. It is estimated that a child is three to six times more likely than an adult when both have received the same dose of radiation.

Indigenous people - whose lands are a special attraction to nucleocrats all over the world. Most nuclear activities, from uranium mining to weapon's testing and eventual waste disposal are carried out in places which are home to indigenous people. Whether in Australia, United States, the Pacific or in India, the same story holds.

Future generations - because radioactive material remains toxic for thousands of years, they will bear the costs without receiving any benefit whatsoever.

The important point to make is that radiation risks are not distributed evenly throughout the population. Neither are the benefits. By adopting a utilitarian perspective there is no need to examine the distribution of the loss and the gain.

The major beneficiaries of nuclear industry are owners of corporations producing and supplying the goods and services involved. (In India the names that stand out are Tata, Larsen & Toubro and the Walchand group.)

Benefits in the form of status and power in addition to remuneration are bestowed upon many scientists and technocrats. The bulk of the population does derive benefit from goods and services produced. But there is an important distinction between the risks borne and the benefits received by this group. The risks are involuntary, whereas the benefits need consent in the sense that they are obtained via monetary payment.

Averaging Syndrome

"By the time we calculate the total loss of radionuclides in an average nuclear plant, average this loss over time to determine the approximate yearly effluence in curies, and then determine average air pollution and deposition on living plants and groundwater, average uptake of radioactive chemicals by plant and animal, average diet and recreational habits of the average person living in the vicinity of the plant, we have a (fictional) estimate of human radiation exposure over the normal plant lifetime. Sometimes the dose is averaged over the whole population of the country rather than the population downwind or downstream from the plant, making the average doses seem smaller. Of course some people receive much higher than the average dose."

Rosalie Bertell *No Immediate Danger.*

The epistemology which underpins the principles of standard setting is positivist. The three main characteristics of this approach are: the rejection of subjective knowledge; a reliance on causal explanations; and the veneration of technical expertise The logical consequence of this kind of thinking is the exclusion or rather non-recognition of value judgements. Atomic energy morality just assumes that nuclear technology raises only technological but not ethical questions.

The reliance on causal explanations allows nucleocrats to implicate carcinogens other than radiation when increased cancer incidence is reported near nuclear facilities. While the nucleocrats demand "absolutely certain proof" of radiation harm they assiduously discourage research which may lead to results contrary to their position.

There are numerous instances where the power over purse strings has been used to scrap prematurely unpalatable research Particularly important areas of study have just been neglected and then claims regarding deleterious effects have been dismissed due to "insufficient evidence." The strangely curious lack of curiosity regarding the effects of high natural background radiation in monazite sands of Kerala on part of atomic energy authorities in India is an instance of such blind spots.

To lack of data resulting from insufficient research one must add the occasions where information has been deliberately suppressed. Most nuclear establishments have been unwilling to disclose health statistics of workers and people living in the neighbourhood of nuclear sites. The French have kept Polynesian health statistics secret as have the Russians details of the Kyshtym disaster.

Given the above, it is impossible to have confidence in safety standards regardless of the composition of standard setting authorities. Yet, it is interesting to find out who are the judges who decide the question of acceptability of risk.

Patrick Green has conducted a comprehensive analysis of ICRP's membership and has concluded that far from being an independent organisation with members elected on the basis of scientific merit, "the ICRP is a dosed organisation whose membership is open only to a small select group of individuals". The majority of these members have been affiliated to an organisation concerned with the commercial exploitation of nuclear energy.

"The concept that all decisions of the government should be the subject of a public debate. ..is a dangerous heresy... The experts must, in the end, be trusted."

Sir Philip Baxter (Australian nucleocrat)

The fact that a small elite formulates safety standards should cause no surprise. After all, if issues are defined in a technical manner, they require 'technical experts' for their resolution. Under the guise of independence and objectivity, divorced from public opinion, technocrats can comfortably sit in judgement.

The Escape Route

It is only when the 'have not" citizens, are deliberately involved in the decision making process that many of the inequities associated with standard setting, will be overcome. The cardinal principle ought to be that " no individual or community will be forced against his/her/their will to absorb noxious by-products of the activity of others".

If we accept this principle as a moral imperative we have two possible pathways to reach our egalitarian objective. Firstly our aim can be obtained by eliminating human radiation exposure. Secondly the consent of those most likely to be affected could be obtained. Let us consider each in turn.

Standard setting authorities themselves acknowledge that all ionising radiation exposures, no matter how small, carry some risk of cancer induction or genetic damage. Considering the potential for widespread contamination following accidents, the extremely long lifetimes of radiological toxins once formed and the routine releases by nuclear facilities into the environment, it is impossible to eliminate radiation exposure, whilst the nuclear industry remains in operation. To outlaw involuntary exposures we must eliminate the source - nuclear industry in its various facets. Alternately, we can convert involuntary exposure to voluntary exposure through the consent of those affected. Here the most powerful argument is the fact that by far the largest group amongst those affected cannot give their consent since they are yet to be born.

If we are interested in achieving a high degree of radiation protection it is logical that standard setting authorities must also include representatives of the unions and community groups, and that they be provided with necessary information and financial resources to ensure that their participation is effective rather than token. Obviously a standard stetting body consisting of those likely to be affected by radiation will develop alternate protection principles to those developed by organisations using equipment that is the source of radiation. The 'burden of proof needs to be reversed so that those responsible for creating the hazard must show them safe rather than those exposed must show injury.

Finally, if radiation standards are public policy and not public pacifiers, then at a minimum the policy ought to include daily emission monitoring by an independent person. Standards suggest what ought to occur, monitoring will detect what actually occurs. If monitoring detects exposures above established protection levels, people must be compensated for any deleterious effects.

The question of compensation does raise the thorny problem of cause, and effect. One possible mechanism to circumvent this problem would be to award compensation on the basis of risk involved. If a certain level of radiation exposure in a given population will result in a certain percent of that population developing cancer, then everyone within

that population who actually does develop a cancer should receive a minimum compensation at that percentage rate. This procedure would represent a significant improvement on the present situation where to all intents and purposes, no-one receives compensation for injuries suffered.

Glenn Foard
Community Education Publication Association inc.
Australia

Glossary of Technical Terms

activity - The number of disintegrations of a given radioactive nuclide over a given period of time. The modern (SI) unit of activity is becquerel (Bq) defined as one disintegration per second.

curie (Ci) - The old unit of activity. One curie equals 37 billion (3.7 x 1010) disintegrations per second. Originally adopted in 1910 as the radioactivity of one gramme of radium.

free radicals - Entities formed after the breaking of chemical bonds holding molecules together. They are chemically extremely reactive.

Ionising radiation - Radiation which can deliver energy in an amount capable of knocking electrons off atoms turning them into ions.

rad (radiation absorbed dose) - The old unit of dose of ionising radiation replaced in the SI with gray (Gy). One rad is equal to 100 ergs of energy absorbed per gramme of body dose. Roughly the X-ray dose needed to kill a mouse.

rem (roentgen equivalent man) - Different ionising radiations produce different amounts of damage to biological tissue. Rem is a unit which takes into account these differences by multiplying the absorbed dose with a quality factor which differs for different kinds of radiations. This old unit has now been replaced by sievert(Sv). One Sv = 100 rem.

mSv (milli-sievert) - Thousandth of a sievert.

ANUMUKTI STILL NEEDS YOUR SUPPORT

Cobalt Blues

Cochin is to have the dubious distinction of pushing India into the era of commercial food irradiation (see box). We have previously carried reports about the harmful effects of this food preservation technique. Here we present a list of accidents that have taken place in irradiation plants around the world.

India's first commercial food irradiation complex is to be commissioned in Cochin shortly. Initially the unit will irradiate spices and later will be extended to fish, prawns, onions and potatoes mainly for export. The complex is being jointly set up by Bhabha Atomic Research Centre and the Spices Board. Cobalt-60 is the irradiating isotope to be used in the unit.

The Central Government has reportedly accepted the Codex General, a safeguard set up by several international organisations under the U.N. to oversee the quality of the irradiated food.

Irradiation is a hazardous process. Exposure to the unshielded sources can be fatal. Routine exposures to even low levels may cause long-term harm. The radioactive materials have to be transported into the plant and the spent sources (still radioactive) removed and any contaminated material disposed of.

Accidents may happen at any stage, causing exposure of workers, the public and the environment. Often, lack of local expertise means that maintainance teams have to be flown in from overseas to deal with emergencies.

The following accidents all happened in plants built and operated under the internationally agreed system of regulation and control. Trade union members in the food industry have reason to be concerned about the health and safety of their members.

* Radiation Technology Inc (RTI), New Jersey, USA.

In 1986. the US Nuclear Regulatory Commission (NRC) revoked the RTI license for repeated wilful violations of worker and environmental safety. Incidents included by-passing safety interlock systems resulting in exposure of a worker to the unshielded source (1977) and illegally burying contaminated material from a leaking cobalt 60 source (1975).

Martin Welt, the company president, ordered employees to He to NRC investigators. The NRC action resulted in his resignation. The US Department of Energy (DOE) promptly hired him to advise on its food irradiation programme. Welt was eventually convicted of conspiracy in the US courts in 1988. His new company Alpha Omega Technology, has approached the World Bank for funds to build irradiation facilities in South East Asia.

* Isomedix, New Jersey, USA.

A leaking source contaminated the pond water which was then disposed of down the toilets, contaminating the sewerage system, and exposing workers to radiation. Workers reported the cover-up. Radioactive contamination was still detectable five years later.

The NRC has cited the company for allegedly overexposing workers, failing to signpost radiation areas, allowing food and cigarettes in radiation areas, operating without authorised personnel and failing to monitor water disposed to the sewer.

International Nutronics, New Jersey, USA.

The company was fined in 1986 after cover-up of a radioactive spill in 1982. Management ordered employees to dispose of the radioactive water down shower stalls, and move their radiation badges from belt to collar to record a lower dose. The contamination was still detectable outside the building ten months later.

* Hawaii Demonstration Irradiator, USA.

A radioactive leak at an irradiator in Hawaii in 1967 contaminated the pond water, shipping cask, roof, machine room, tools and worker's clothing. The clean-up cost the state $385,000 in 1979. Dangerously high levels of contamination were still detectable outside the building in 1980.

* Radiation Sterilizers Inc, Georgia USA.

A leaking caesium source in June 1988 contaminated the pond water, workers' clothing, cars and home carpets, as well as some of the irradiated products including medical supplies and milk cartons. The clean-up was still going on in 1989 and had already cost several million dollars. The investigating team recommended that new regulations on radiation safety and emergency plans are needed for all US irradiators.

* University of Tennessee, USA.

A worker bypassed the safety system of an irradiation facility at the University of Tennessee in 1971. He survived the high dose of radiation.

* Benton Dickinson, North Canaan, Connecticut, USA.

Aluminium boxes containing products being irradiated, jammed into the source rack in 1981, preventing it from being lowered. Despite this, the control panel indicated that the cobalt source was safely inside its storage pool. It was only the radiation monitors indicating high radiation levels that warned of the problem. Technicians had to be called in from Canada. While lowering the rack they dislodged several cobalt rods which had to be recovered using long handled tools and mirrors.

* Stimos, Pontecico, Italy

A maintenance worker entered the irradiation cell of a corn irradiation facility on the conveyor belt while the source was operational. He received a high radiation dose and died 12 days later.

* Institute for Energy Technology Irradiation Plant, Kjellet, Norway.

Failure of savety devices allowed a maintenance technician to enter the irradiation cell with the source exposed. He died 13 days later.

Delmed plant, San Salvador, El Salvador.

Three workers at the Delmed plant received serious radiation injuries after irradiation equipment malfunctioned in February 1989. Delmed had to call Nordion, the suppliers of the plant, to send a maintenance team from Canada to remove the cobalt from the defective source rack.

* Steritech, Dandenong, Australia.

This plant has to be shut down for five days because a wire cable controlling the Cobalt 60 source rods had jammed, preventing the rods from being lowered into the pool. A maintenance team had to be flown In from Canada to remedy the problem. Technicians and equipment to deal with such emergencies are not available in Australia.

Unthinking the Unthinkable

'Nuclear weapons are machines, and machines, it has been said, are finally ideas.' On the basis of this thought-provoking statement Jeff Smith in *Unthinking the Unthinkable* criticizes the nuclear policies of establishment and its opponents alike.

Unthinking the Unthinkable is not an easy book! This is not so much because of its language for the essay is clear and well- structured. But the author asks the reader to question some of those views which have become so common that they seem to be rather natural : Has human history really entered a fundamentally new age with the invention of the nuclear bomb? What does it mean when the bomb's destructiveness is compared with the omnipotence of God? Does progress in knowledge and sciences create new realities which we cannot escape? How can anybody even think of destroying whole populations in a nuclear war?

Of course, it is not possible to unthink nuclear weapons, to make them disappear by mere thinking. The fact that once invented, harmful technologies remain with us in a mephistoan way has disquieted the more thoughtful spirits in the last centuries. Jeff Smith, however, thinks that 'people have never availed themselves of every technically feasable means of violence.' Here he sees a chance: if we understand the causes of nuclear weapons, we perhaps can attempt to re orient the political thinking which necessitates nuclear arsenals.

In his effort to problematize the common-sense assumptions underlying the nuclear debate on both sides, the author uses a highly relevant, but hitherto neglected method. While admitting their respective value, Smith is discontent with economic and psychological approaches as well as with histories describing the nuclear culture of planners, scientists and strategists. He refers to literary and textual analyses and in his search for the root causes of the nuclear problem he moves back as far as to the early Middle Ages. Much of Western thinking in the backgound to the issue under discussion had been shaped in the times of St. Augustine.

Smith, who anticipates Marxist criticism of his basic assumptions, does not deny the existence of economic interest as a cause for the creation of nuclear arsenals. But he sees weapons, nation states and technologies as results of beliefs generated by discourses and ideologies in historical time. This leaves hope, for 'modern politics is simply discourse, and discourse can always be deciphered. States and their war policies are not mysterious, fixed edifices... They are products of cultural history, and once we see this, the problem of reinventing them appears in a whole new light.'

However, there are some obstacles in the way of realizing this hope. Often the construction and deployment of the nuclear bomb in the first half of the 40ies is regarded the beginning of a fundamentally new age in the history of mankind. Refuting this common theory, Smith quotes Lewis Mumford who regards the invention of the dock as the key Western invention. Other authors have argued that inventions like an improved plough in the seventh century have changed the relation of the West to nature. Looking back in time merely a few decades, perhaps obscures the continuity in cultures and gives a disproportionate emphasis to recent developments. In such a situation we become helpless by inactively looking back at the supposedly *golden days* before the bomb. This is no way out.

In his analysis, Smith uses a wide range of sources from philosophical texts to films like *War Games* and *Dr. Stangelove*, from Shakespeare's *Henry V* to Ronald Reagan's speeches. Shakespeare proves especially useful to demonstrate the developement of the nation-state concept at the beginning of modernity. This concept of a nation-state which monopolizes the means of violence up to extremes like total civilian destruction is necessary for the deployment of nuclear weapons. 'States are simply made singular subjects - metaphorically treated as if they "did" things, acted as wholes', a phenomenen which Smith calls *modem animism.* It leads to a neglect of the individual human being who wants and does things and finally, itlets total destruction appear moral, if it only achieves its ends.

Similarly the author problematizes the supposedly valuelessness of technology, another means to achieve ends. 'Perhaps besides being machines themselves, nuclear weapons are also independent products of the whole modem program that machines represent, along with wars and states: a program that places new value on getting the job done, no matter how diabolical that job might have seemed to an earlier way of thinking.'

Here, Smith's essay becomes relevant to the ecological movement as well: it reminds of other 'jobs' like energy production and development by large scale deforestation or construction of socially and ecologically destructive super-dams.

Whereas the discussion of the origins of the nation state is nothing new for the political historian, the analysis of Reagan's speeches on SOI shows how much Western history has influenced the concept of deterrence. Both, India and Pakistan are playing with the nuclear option. They are dealing publicly with a concept which was developed by the master players of nuclear deterrence and is a product of an alien cultural history. This concept which, moreover, is now being understood as a problem in its place of origin, has been isolated from context and is being thoughtlessly applied to different circumstances.

Jeff Smith, while challenging the Western reader to re-assess the ideas which created nuclear weapons in the first place, is relevant to South Asia as well. His book is of value to all those who want to critically understand the roots of policy concepts which are offered by the West to other parts of the world as logical and sane ways of solving problems.

Smith's suggestions remind one of discussions in the Gandhian movement While stressing the importance of values of co- operation and community, he feels that creating new belief systems would be historically easier to achieve than a new growth of community. This task is definitely more difficult for the urban Western activist than it is for the critical movement in South Asia. Alternate non-Western systems of thought are available and alive although they do not enjoy as much prestige as their Western counterparts. Besides, they are often interwoven with social structures which allow different approaches to development (as Chipko and Chandi Prasad Bhatt's experiments have shown).

The author's recommendations for a new antinuclear policy can be understood as advice to any social activist. He outlines this policy as :

* reflecting and understanding of the relationship between people's feeling and their political actions
* showing respect for people's personal feelings
* never ruling out any human impulse as irredeemably bad
* doing less moralizing and more analyzing
* working to change discourse patterns
* striving to keep the cultural discourses going in **order** to allow new ideas and solutions appear.

Perhaps Smith's suggestions - after an analysis as profound as this book - seem to be rather vague. But, then, what do we expect from an effort to understand the nuclear problem? A research book like this cannot do more than offer a new viewpoint to those actually working in the field. They will enjoy the sharpness of Smith's thought as well as his moral awareness. Hopefully they will also profit from the stimulation that this book provides.

Jelf Smith
UNTHINKING THE **UNTHINKABLE** :
Nuclear Weapons and Western Culture
Indiana University Press (1989)

LETTER BOX

Dr. Shivaram Karanth had offered himself as an independent candidate for the Karwar Loksabha constituency during the recently concluded elections. His campaign was actually a campaign for environmental education of the people. Though he lost he did receive nearly 60,000 votes. The voters of Uttara Kannada district elected for the third time running a most selfish and inactive person.

On the 21st of December, 1989, there was a "human chain" formed around the office of the Assistant Commissioner at Sirs! as part of the agitation to stop the nuclear power plant at Kaiga. Nearly thousand people joined Dr. Karanth in forming the human chain which continued around "Bidki Bail" - which is a ground for public programmes in Sirsi. The human chain was to celebrate 200 days of "Saradi Upavas Dharani" (relay hunger strike) against the Kaiga plant.

A signature campaign against the continued construction of the plant was launched. The first two persons to sign the petition, Shri Bheema and Shri M.L.Hegde, did so with their own blood. Both of them had participated in the Dharani for all the 200 days. Smt. Vasanti Hegde, the president of the Sirsi Parisar Samiti and a member, of the Zilla Parisar Samiti said that if the government did not care for peaceful agitation, it would have to face the consequences of its undemocratic behaviour.

Same evening there was another programme in Ankola town. It was attended by thousands of people. Ankola Parisar Kuta was inaugurated by Dr.

Kusuma and a lamp for the preservation of the environment was lit by Dr. Karanth. This town has a great tradition of struggle during the freedom movement. Dr. Shivaram Karanth recalled the great history of this taluka and asked the people to fight unitedly to protect mother nature for future generations and for innocent plant and animal life who too has equal rights on this earth.

Dr. Kusuma
Snehakunja, Kasarkod, Honnavar Taluka
Uttara Kannada Karnataka 581342

During my visit to Lahore, Pakistan last month I met Dr. Zafar Omer, a consulting physician, who made a strong plea for curbing nuclear arms race in the subcontinent.

Although the occasion was India-Pakistan Environment Conference, there was strong expression of a felt need for peace and amity between the two neighbours so that resources could be saved and put to more constructive, regenerative use. I think you will agree that in this region there is socio-cultural basis and geo- political necessity for ending the cold war and moving towards peace. It may be worth thinking about a two-country Citizens' meet on the issue of nuclearization and its dangers.

Kishore Saint,
Ubeshwar Vikas Mandal,
10-G, Fatehpura, Udaipur 313001

I have been receiving Anumukti and I read every word of it. On the one hand, it makes me sad to see that India is following the same path that the West has followed, without learning anything, not even from their accidents and failures; and on the other hand, I find it encouraging that people like you are fighting this monster and devoting your lives for it.

It is not just Anumukti that we have to fight for (or for that matter we can hope to get); it must be total freedom from the clutches of materialism. After all, nuclear power and nuclear weapons rest on a psychological mindset called materialism - aggrandisement of goods and attachment to goods and therefore denial to others of their rightful share, in other words, selfishness. In my view the only way it can be achieved is Gandhiji's "non-cooperation with evil." In this case the evil is the power company and the government. So, people should simply not use electricity generated in nuclear power plants and also not buy goods produced by using such electricity. But that means, being prepared to live simply and having to take control of their own lives. That's asking big!

Ashok Shimpi
4419 SW 23 St. Topeka,
KS 66614 U.S.A.

There are plans afoot to observe January 19th, 1990 as 'Protest Day' demanding a ban on continuation of nuclear activities. India week of 23rd to 30th December, 1989 has published a detailed account of uranium mining at Jaduguda and the Nuclear Fuel Complex at Hydrabad.

Dr. Dhirendra Sharma
M-120 Greater Kailash-I
New Delhi 110048

Thank you for Anumukti. It will be very helpful for us to know about what is going on in India, because there is virtually no information on the Indian situation. I am especially interested in knowing about antinuclear protest. Is the antinuclear movement very big in India? How many people are there against nuclear power?

I am also involved in the food irradiation issue and if you are interested, I can send you a small booklet on the Japanese situation.

Yurika Ayukawa, Citizen's Nuclear Information Center, 3f Watanabe Building, Higashiueno 2-23-22, Taito-ku Tokyo 110 Japan

Subscription Rates:
Rs.25/-per year South Asia
Rs.250/- Lifetime (only within India)
U.S.$ 15/-per year air mail overseas
(Rs.200/-per year if paid for in India)
Please add Rs.6 for cheques
Demand Drafts should be addressed to:
The State Bank of India, Valod (0531)

Editor: Surendra Gadekar

Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

Editor Anumukti

Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA
Published by : S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat Printery, Ahmedabad.

PRINTED MATTER BOOK POST

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Volume 3 Number 5 **April 1990**

When I decided to give up a career in physics and take to full time antinuclear activism, many of my physicist friends were sceptical. Not that my career was any great shakes, but still it did provide the daily bread. "All that you really need to do is to take a few months off and write down clearly all the arguments against nuclear power and then convince the policy makers about them. After all what you are saying is not something radically new. Other countries are in the process of abandoning nuclear power and anybody reasonable can see the force of these arguments", so went their plea.

No doubt, physicists are somewhat naive when it comes to predicting the 'real world'. But to-day, four years later, even my friends are convinced that it is not mere sweet reasonableness which is going to drive out nuclear power or any other anti-people technology from this land. Is *Anumukti then* doomed to failure? A battle for a cause already lost!

No, because there is a language that policy makers do understand— the language of organised mass protest. And it is heartening to see that protest is beginning to bloom everywhere. In Eastern Europe it has blossomed like a desert flower after rains. Old, long hidden, skeletons have come tumbling out of nuclear cupboards as freedom, the right to know, accountability of public officials, become the key words in the new order. It seems increasingly likely that nuclear power has no future in that part of the world. Already a number of projects have been postponed, cancelled or abandoned unfinished as a direct result of public agitation.

At home too, people are becoming aware of the fact that without protest, survival itself becomes difficult. It is a hopeful sign that activists in Kerala have already started organising in response to the nuclear lobby's Interest in the State. The victory at Kothamangalam needs an encore. But what is especially encouraging is the fact that even at Rawatbhata in Rajasthan-the site of India's first CANDU readors-that people have realised the false promise of the nuclear future. The moment of waking heralds a new dawn.

Kakrapar to Rawatbhata Cycle Yatra

Sampoorna Kranti Vidyalaya, Vedchhi is organising a cycle rally from Kakrapar to Rawatbhata to commemorate Chernobyl accident and as a mark of protest against the continued government support to antipeople nuclear policies. The rally which would commense on April 10th, would mainly pass through adivasi lands of Gujarat and Madhya Pradesh and reach Rawatbhata on April 24th in time for the antinuclear convention being organised there. On the way there would be a large number of small public meetings at which participants would try to raise public conciousness on the nuclear and other 'development' issues. Attempts would be made to make contacts with individuals and small grass-roots groups so that an effective organisation can be built for the future.

The rally will focus attention on four main themes:

(1) Nuclear energy has proved to be neither safe nor clean nor cheap. Recent findings in other countries (BEIR V-report, Sellafield leukaemia clusters, privatisation fiasco in U.K. etc) just show that nuclear energy is an even bigger failure than was apparent even a few years back.

(2)Although the rationale behind installation of a nuclear facility is local development - it is precisely the 'locals' who dont develop. Thus, even after 17 years of an operating reactor and almost 30 years after the decision to build the plant was taken, people who live in villages surrounding Rawatbhata Atomic Power Plant (RAPP) have yet to receive electricity, drinking water or basic emergency medical services from the plant.

(3) Big dams - besides causing large scale environmental degradation themselves - are precursors of atomic power projects. This has happened at both Rawatbhata (Rana Pratap Sagar dam on river Chambal) and Kakrapar (Ukai dam on river Tapti). The new proposed dams on the Narmada too - despite all protestations regarding fulfilling the drinking water needs of thirsty people of Kutch and Saurashtra - would no doubt be strong attractors for a future nuclear power plant.

(4) All over the world nuclear power has paid special 'attention' to indigenous populations. Whether it is uranium mining, or location of nuclear installations or nuclear weapons (peaceful nuclear device) testing, it is the indigenous people who bear the greatest risk and get the least benefit. The route of the rally lies mostly through adivasi land to highlight this injustice.

Singing a New Tune

A report by the National Research Council of the US National Academy of Sciences (NAS) has concluded that the risk of exposure to low levels of radiation are at least four times — and in some cases, up to 14 times — greater than previously acknowledged by most radiation scientists. The long awaited *Biological Effects of Ionizing Radiation (BEIR - V)* report, released late last December, confirms the view held by dissident scientists. Mainly, that there is no safe dose of radiation and that the risk of radiation exposure follows a linear model. The reports findings are expected to lead to new standards for workers in the nuclear industry worldwide.

In 1980, the Academy's *BEIR-III* report had adopted a "linear- quadratic model", which presumed that low levels of radiation offered little to no risk. BEIR-V report is based on more recent data about the amount of radiation released by the atomic bombs dropped on Hiroshima and Nagasaki, which was considerably less than previously believed, and also on the fact that bomb survivors are developing cancers at much higher rates than projected by *BEIR-III.* The report is a step in the direction of vindication of such antinuclear pioneers as Drs. Rosalie Bertell, Alice Stewart, Irwin Bross, Thomas Mancuso, John Goffman, Earnest Sternglass, the late Karl Z Morgan and many others much of whose work had previously been ignored or ridiculed by the nuclear establishment.

Using new information the report concludes that the risk for solid tumour cancer is three times greater than previously believed while the risk for leukemia is four times greater. The report also found a much greater risk of mental retardation among unborn babies exposed to low level radiation during the eighth to fifteenth weeks after conception. The report found that women are slightly more likely than men to develop cancers from low levels of radiation and that in some type of cancers, children are more susceptible than adults.

The BEIR-V report also concluded that normal background radiation poses a cancer risk up to 14 times higher than acknowledged in BEIR-III. According to the report, between 520 and 600 fatal cancers will be caused by lifetime exposure of 100,000 persons to 100 millirems annually - an average background dose. BEIR-III had predicted that only 25 to 119 fatal cancers would develop. However, BEIR-V only measured fatal cancers; the risk of developing non-fatal cancers is another 50% greater.

The panel was not charged with making public policy recommendations based on its conclusions and it did not attempt to do so. But Warren Sinclair, president of the US National Council for Radiological Protection, the panel which sets radiation exposure limits in the US, said that "present occupational limits will very likely be reduced" because of BEIR- V. There will most likely be an even more drastic reduction when a future BEIR-VI takes into account the recently released data on the 500,000 workers in the US Department of Energy's nuclear weapon's facilities.

Meanwhile Back Home....

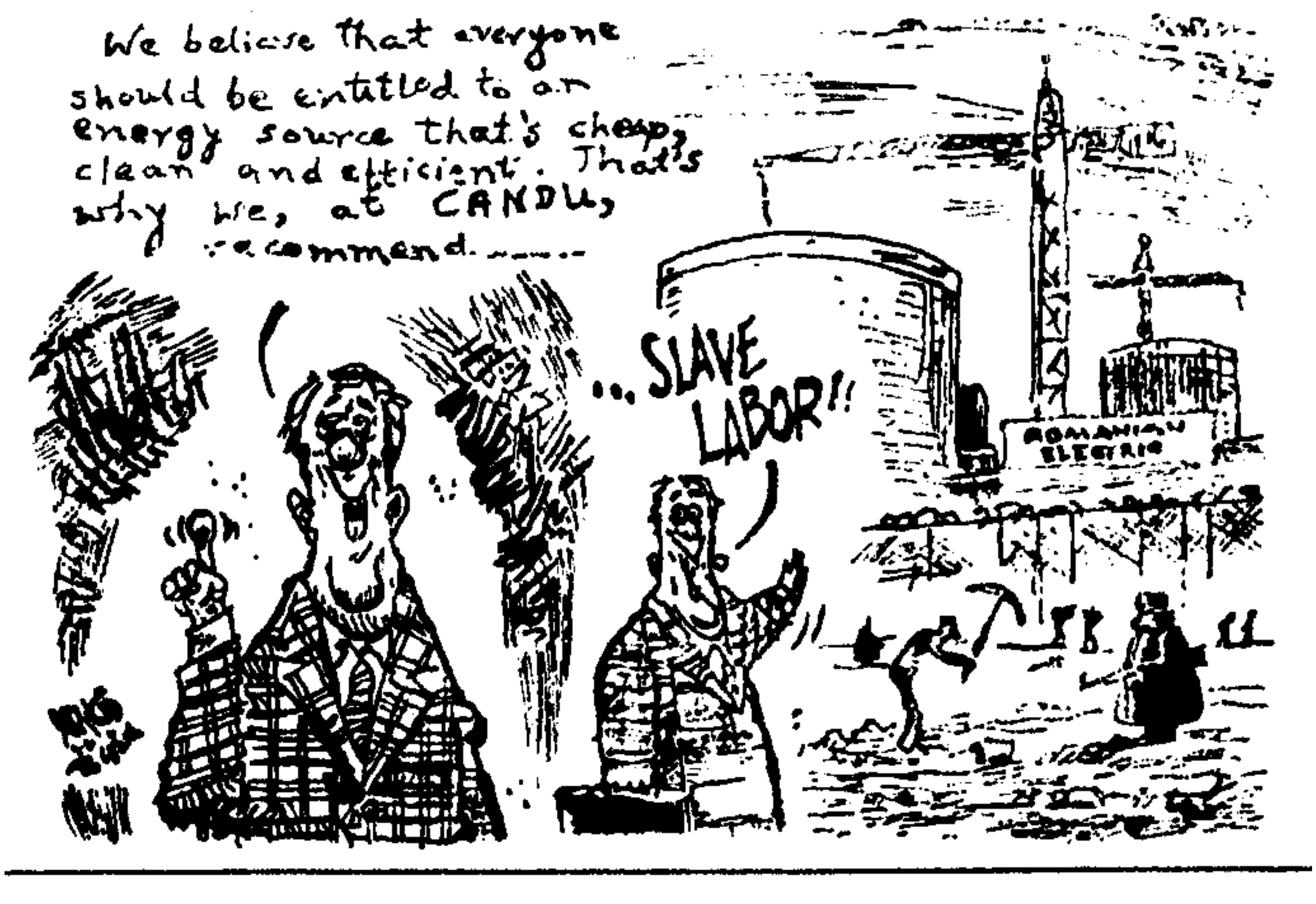
The Atomic Engergy Regulatory Board (AERB) has cautioned against the abnormal increase in the total radiation exposure at almost all nuclear establishments in the country. Prof. A.K. De chariman of AERB, said that the Board's Safety Review Committee had noticed that the total radiation exposure at nuclear power stations had gone up to 1,700 man-rem. It has asked the stations to bring the figure down to around 1,000 man-rems. Each individual should not be subjected to more than one rem of radiation. In 25% of the cases at Rawatbhata (RAPP) and Kalpakkam (MAPP), the reading had gone up to 2.5 rems. Recently RAPP was shut down for a few days as a result of increase in radiation in take.

Source: Indian Express 11.3.1990

Conscripts Construct CANDUs

The world knows that the regime in Romania led by the late Nicolae Ceausescu was founded on brutal repression and routine violations of human rights. Since Ceausescu's execution, it has also become clear that Canadians played a role in that repressive regime through the deals made by Canadian government agencies to build CANDU nuclear reactors in Romania. Forced labour has been reported on the construction of Canadian CANDU reactors in Romania, and Canadian External Affairs officials admitted that they had previously received reports of conscripted labour being used at the nuclear megaproject. It seems that "commercial considerations caused countries such as Canada to overlook Ceausescu's villainy."

Canada began negotiating the sale of these reactors in 1967. By 1977, Canada was reported to be close to an agreement with Romania for the construction of up to sixteen reactors. That same year, Canada and Romania signed a nuclear cooperation treaty that included nuclear weapon non-proliferation safeguards. In July 78, an agreement was signed covering the engineering services for one reactor, and by October that year, Atomic Energy of Canada Ltd. (AECL) announced that Romania


We believe that everyone should be entitled to an energy source that's cheap, clean and efficient. That's why we, at CANDU, recommend......
...SLAVE LABOR!!
ROMANIAN ELECTRIC

had agreed to buy two reactors and most of the heavy water needed to run them. In August '83 construction on two reactors began at Cernavoda, a small city on the Danube River, dose to the Black Sea.

In retrospect, barter trade arrangements, negotiated to allow Romania to pay for reactor parts without currency, may have contributed both to the hardships that Romanian workers have endured, and to predictable financial losses for certain Canadian manufacturing industries. While most Romanians were chronically short of clothing and food, and living in dwellings with only minimal heat, Romania was exporting millions of dollars worth of garments and food products to Canada. These goods were apparently sold at bargain prices across Canada, thus undercutting comparable Canadian-made items. Romanian plate steel, imported under the same conditions, is reported to have cost Canadian steel companies in excess of $10 million in lost sales. Most Canadian nuclear suppliers, with the exception of AECL, took 100% counter-trade on all their sales to Romania. Romanian steel plates that were part of the trade deal eventually became subject to Canadian dumping tariffs.

An independent study of AECL's commercial transactions, published in 1987 by the Economic Council of Canada, confirms that the crown corporation's export history has not been profitable. It was estimated at that time, that AECL had cost federal taxpayers $12 billion (1981 currency) since its inception. Clearly, AECL's difficulties in selling CANDU reactors abroad, and the Canadian nuclear industry's fears of financial collapse were prime factors in this highly questionable deal with Romania. Unfortunately, the Romanian workers, upon whose industrial production the deal was founded, were a captive and impoverished workforce. Canadian officials did not let the prospect of Romanian deprivation affect their willingness to do business.

The deal with Romania covered not only the construction of nuclear reactors, but also the transfer of nuclear technology, and the proposed sale of heavy water. At each successive stage, this deal brought Romania closer to having the capacity to produce nuclear weapons. As Romania became increasingly unstable in the 1980s, the risk this deal posed to international security should have been clear to Canadians. Concern was highlighted in 1985, when AECL signed an agreement that gave Romania the right to re-sell CANDU components to other countries, thus increasing the risks of horizontal nuclear proliferation. With Romania now in a politically volatile state, it is difficult to predict whether construction on the CANDU station will continue and if non-proliferation agreements will be adhered to by the new Romanian government. The Romanian election, to be held in May, will no doubt bring more news about whether construction of the five reactors at Cernavoda will continue or not.

Rod MacLeod

Nuclear Awareness News Winter 1989/1990

Chernobyl— The Sad Saga Continues

Between 1987 and 1989, a further 150,000 people (in addition to the 135,000 people evacuated at the time of the accident) were evacuated from contaminated areas in the Soviet Union. They had accumulated high doses of radiation through continued exposure to the fallout from the 1986 disaster. Another hundred thousand more people can expect evacuation between 1990-1992, when they approach the already too high emergency permissible radiation limit. At least 60,000 people mainly young persons and professionals have already left the areas without waiting for compensation or official resettlement. More than 220 villages have been already abandoned and some 600 villages and towns were included in a programme of systematic decontamination.

In 1989, it was officially acknowledged that an area of about 10,000 square kilometres in various parts of the Ukraine, Byelorussia and the Russian SSR was contaminated with cesium-137 to levels higher than 40 Ci/square km and was considered dangerous for human habitation. About 150 villages are now waiting for the next wave of evacuation. In some still inhabited "hot-spots", levels of radioactive cesium as high as 90 — 140 Ci/square km have been found. The local population, particularly children are already suffering adverse health effects.

A significant part of the heavily contaminated area is far from the reactor site - in some cases between 100 and 400 kilometres away. High contamination was caused due to the fact that it rained on these areas during the time the damaged reactor was belching out radioactivity. Levels of cesium-137 between 15 and 40 Ci/square km were recorded over some 22,000 square kilometres during 1989. Western standards presently consider even 15 Ci/square km as unsuitable for agriculture, particularly livestock farming.

Some reports indicate that some 100,000 sqare kilometres of land in the European part of the Soviet Union has levels of cesium-137 and strontium-90 higher than 50,000 Bq/square metre. However, these rural areas and even those with contamination levels above 500,000 Bq/square metre, continue to be farmed although the agricultural produce from there is required to undergo special treatment. According to the regulations, livestock must be transferred to clean feeding about two months before slaughter. Milk is used only to make butter and cheese. But because of food shortages, violations of the rules are common.

Approximately one million people live in areas now designated as "permanent strict radiation control" areas. The Ministry of Health has raised the maximum permissible limit of radiation dosage in these areas far above internationally recommended limits.

Sources: The Environmental Destruction of the Soviet Union" Zhores Medvedev The Ecologist Vol.20 No. 1 January 1990.

Rawatbhata : Development Brings Dissatisfaction

Rawatbhata near Kota in Rajasthan is being made into a large centre of nuclear generated electricity. The construction of the first reactor started in the sixties and by late 1973 the reactor had begun commercial production. The second unit commenced production on 1st April, 1981. Construction of the third and fourth unit has already begun and four more units are proposed. All these units are situated on the banks of the Rana Pratap Sagar dam reservoir. Within a 100 km distance three other dams have been built on the Chambal - the Gandhi Sagar dam, the Jawahar Sagar dam and the Kota barrage which together form the Chambal valley plan. All the dams produce hydroelectricity besides providing water for irrigation through a network of canals. On the top of this there is a thermal power station in Kota. A number of large industries have already started functioning there. One would expect that with so many 'temples' of modern development all concentrated in one place, the people of this region would be contented, happy and staunch supporters of the 'development' process. In fact before reaching Rawatbhata this is precisely the impression one gets - where once there was a jungle in which tigers roared, today there are new and newer colonies, shopping centers coming up by the minute. New buses run up and down Rawatbhata's roads.

But on January 13th, 1990, there was a meeting in Rawatbhata where an absolutely contrary picture emerged. This meeting had been called to discuss the benefits and the harm caused by the local nuclear power plant. It was attended by the sarpanches of two other villages besides Rawatbhata, a number of locally elected officials, farmers, tradespeople, unemployed youth besides some representatives from outside. In the meeting it became obvious that local people share feelings of disappointment, anxiety and anger and they feel that all these reactors, industries and dams have been of no use to them.

The meeting was chaired by Shri Kishanlal Gupta the former chairman of Bhaisroad Paochayat and a resident of Eklingpura village. He said that the area was once a very good jungle and pasture land from which the local residents got various kinds of fruits, roots, leaves, wood, cattlefeed and other produce. The tornado of development has laid bare all this. The local residents have not benefited at all. Even today, most neighbouring villages do not yet have proper roads so that in an emergency the villagers could be taken elsewhere in a hurry. Although Rawatbhata is such a major electricity generating centre and supplies electricity to all parts of the northern grid, but the local farmers are still pining for electricity connections. He mentioned instances of farmers whose applications for electricity connections were still pending after ten years. In the same vein, the Rawatbhata village panchayat chairman Shri Ratanlal Gupta said, "The village Tamlav situated right next to the reactors is yet to receive electricity". There are also villages in the area where drinking water is still a serious problem and the water has to be carried in tankers during the summers.

Another fact which was illuminated during the discussions at the meeting was the discrimination practiced by the RAPP authorities between their own employees and the local population in matters relating to basic facilities. The local people have great difficulty in getting tap water connections. Even in cases of severe emergency, local people are not treated in the hospital attached to the power plant. This, despite the fact that there is no other hospital in the vicinity. In fact the government ought to set up a special hospital and hearth centres to deal with the damage caused by the radioactive pollution of the nuclear power plant. Even the suez of the colony of employees of RAPP is allowed to flow freely through the localities posing a grave health risk. The Rawatbhata village panchayat has drawn the attention of the authorities many times to these problems through correspondence and only received empty reassurances in return.

Expectations regarding jobs and other employment opportunities are naturally aroused in the neighbouring villages the moment a large project is announced. But most of the jobs go to the well educated from the cities and metropolis while only manual work is left for the local people. The same has happened in Rawatbhata. The unemployed youth in Rawatbhata have organised themselves into a union which has raised the demand of local employment. Two days before the meeting they had carried out a 'Rasta-roko' agitation. The chairman of the union Shri Rajesh Singh Rajora told the meeting in very clear terms, "We do not want any new reactors here - they are of no use to us."

There is a great deal of anxiety amongst the local population regarding radiation hazards of nuclear power plants. The disasters of Bhopal and Chernobyl are particularly to the fore in peoples minds. There is no information regarding what kind and amount of damage an accident can cause; what to do in the event of an accident; what are the possibilities of an accident at Rawatbhata; what are the emergency plans of the authorities etc. On none of these points have the authorities been forthcoming with information. About one and a half years ago an excercise was carried out to test emergency preparedness. However, since the authorities have always maintained that an accident was impossible, the local residents wonder why the need to have emergency preparedness drills. Last September there was a gas leak in the heavy water plant which caused a great deal of panic in the area. The security guards and the employees had decamped wearing masks in trucks. The residents of Tamlao village had also felt the smell of the gas. But the authorities have tried to cover-up this incident calling it a rumour. Due to this their credibility has reduced greatly. Any criticism of the atomic energy programme is labelled by the authorities as the work of foreign inspired people who want to weaken the country. There was a consensus at the meeting that the authorities have no other excuses left to offer. Ratna Mathur, who had come from Delhi said that the reality was just the opposite. Prosperous countries are cutting back on their nuclear programmes under the pressure of public opinion generated by Chernobyl. Hence there is a maximun pressure from them on the Third World nations to accept the useless technology, hardware, instruments, etc. which they want to dump.

Authorities also claim that whatever the dangers involved, electricity is necesssary for progress. But as one person said in the meeting, "There can be no development at the cost of human life." Rajeev Singh from Delhi clarified that the restart of Rawatbhata Unit 1 after there was a crack in the end-shield was not an achievement to be proud of but rather a crime against humanity considering the risk involved. Nowhere else in the world is a reactor with a crack in its end shield being operated. Sunil from Hoshangabad said that nobody could believe the authorities. They are going ahead with their programme despite growing protests only because their vested selfish interests are involved. They do not consider the local population any better than insects and treat them accordingly.

The slowly gathering storm of protest in Rawatbhata is about to break. The authorities of RAPP have started following a carrot and stick policy of simultaneously giving concessions and suppressing dissent. They have promised to make a junior college in Rawatbhata village. Shri Ratanlal Gupta, the Rawatbhata village sarpanch said that there was a proposal to supersede the village panchyat along with panchayats of another two villages and to incorporate them into a special development authority whose control would be exercised by a government appointed administrator. This way. the protest voiced by locally elected village officials could be silenced.

The meeting ended by forming a struggle council (sangharsh samiti). The samiti has decided to collect information on this issue and has called a conference on 25th and 26th of April, at Rawatbhata for this purpose. They want to establish a dialogue with other struggle movements and have invited representatives to come to the conference.

There is no doubt that modem development projects are raising anxities and fears amongst the people not only at Rawatbhata. It is also apparent that the high priests of development have no answer to calm these fears.

(Translated from Hindi)
Sunil
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A "Parmanu Pradooshan Sangharsh Samiti" to fight against the radiation pollution caused by nuclear power plants both operating and proposed in the Rawatbhata area has been formed. The samiti has decided to commemorate Chernobyl day by calling a two day convention on April 25th and 26th, We invite friends and workers from other regions to come and join us. There are regular buses every hour from Kota to Rawatbhata starting from Gumanpura bus-stand between 7 A.M. and 10 P.M.

Contact: Shri Ratanlal Gupta — Sarpanch Rawatbhata Panchayat.

Radiation Kills Children of Nuclear Workers

An alarming UK study linking childhood leukaemia to fathers exposed to radiation has created furor in Great Britain and elsewhere. (See Box) The study found that children living in Seascale, a village near the Sellafield nuclear reprocessing plant, were ten times more likely to suffer from leukaemia than children in the general population; one in five of the children with the disease studied had fathers who worked at the plant. The study, led by Professor Martin Gardner of Southampton University on behalf of the British Medical Association (BMA), was published in the *British Medical Journal* on 16th February, and was picked up immediately by the British media, making the front page of virtually every daily coming out of Britain and prompting calls for action.

The BMA study found an unusually high incidence of leukaemia among children living near the Sellafield plant in Cumbria, in the northwest of Britain, and provides the strongest link yet between leukaemia clusters with nuclear power facilities. Media reports are calling it the first study of its kind in the world, but in fact it is the latest in a long line of studies (most of which have so far been ignored) that show that radiation is considerably more dangerous than what was assumed when the current safety standards were set. Where it differs from most other studies, though, is in the genetic implications: The study suggests that radiation at Sellafield effected the sperm of men working there, possibly introducing a genetic mutation. It found that where workers received only 10 mSv in the six months prior to conception, their children also faced a 6-8 fold increase in risk of developing leukaemia. (The current annual dose limit is 50 mSv). It is not, however, the first time that damage to sperm has been linked to radiation. For example, according to Greenpeace, genetic implications of radioactive exposure on nuclear submarines were revealed in a study which showed that between 1972 and 1975 four babies born to submarines on the Polaris submarine HMS Resolution were born with hare lip and cleft palate. In 1986 Dr. Maha Linet, then at Johns Hopkins University in Baltimore, looked at 309 cases of childhood leukaemia in Shanghai. She and her Chinese colleagues found that the disease was more common in the children of men who had diagnostic X-rays before conception than in those of men

Results of case-control study of leukaemia and lymphoma among young people near Sellafield nuclear plant in West Cumbria.

Results : Expected associations with prenatal exposure to x rays were found, but little information was available on viral illnesses. Relative risks for leukaemia and non-Hodgkin's lymphoma were higher in children born near Sellafield and in children of fathers employed at the plant, particularly those with high radiation dose recordings before their child's conception. For example, the relative risks compared with area controls were 0.17 (95% confidence interval 0.05 to 0.53) for being born further than 5 km from Sellafield, 2.44 (1.04 to 5.71) for children of fathers employed at Sellafield at their conception, and 6.42 (1.57 to 26.3) for children of fathers receiving a total preconceptual ionising radiation dose of 100 mSv or more. Other factors, including exposure to x rays, maternal age, employment elsewhere, eating seafood, and playing on the beach did not explain these relationships. Focusing on Seascale, where the excess incidence has predominantly been reported, showed for the four out of five cases of leukaemia and one case of non-Hodgkin's lymphoma whose fathers were employed at Sellafield and for whom dose information was obtained, that the fathers of each case had higher radiation doses before their child's conception than all their matched control fathers; the fattier of the other Seascale case (non-Hodgkin's lymphoma) was not employed at the plant. These results seem to explain statistically the geographical and employment associations with Sellafield that were found.

Conclusions : The raised incidence of leukaemia, particularly, and non-Hodgkin's lymphoma among children near Sellafield was associated with paternal employment and recorded external dose of whole body penetrating radiation during work at the plant before conception. The association can explain statistically the observed geographical excess. This result suggests an effect of ionising radiation on fathers that may be leukaemogenic in their offspring, though other, less likely, explanations are possible. There are important potential implications for radiobiology and for protection of radiation workers and their children.

British Medical Journal 17 February 1990 who had not. The risk of cancer increased with the number of X-rays that the men had been given. Similarly the fifth report of the *Biological Effects of Ionising Radiation series* (See also "Singing a New Tune" page , this issue) describes Japanese research which shows that two out of the 1,630 women pregnant at the time of the atomic holocaust gave birth to children who subsequently contracted childhood cancers. Normally fewer than one in 1,630 would be expected.

The scientists in the BMA study found that of 52 local children who had leukaemia between 1950 and 1985,10 had fathers who worked at Sellafield. The link was strongest where the father had received particularly high doses of radiation before the child's conception. Scientists and engineers at Britiish Nuclear Fuels (BNFL), which runs the Sellafield plant expressed "deep concern" and called for urgent action to reduce radiation dose limits for employees. At the same time, however, BNFL said that while the report came from a "respectable source", it did not believe it established a link between radioactive discharges from the plant and childhood leukaemia.

Workers at Sellafield were told about the findings before they left work on the day before the study hit the front pages. Shop stewards began considering their response that night, but already the Transport and General Workers Union, on behalf of the industrial unions in the nuclear industry, a/e calling for urgent action. On March 6th three families, in which the father works at Sellafield and the children have cancer, served writs on British Nuclear Fuels as a result of this study. Martyn Day, solicitor for families claiming that their children were made ill by radiation, said that already half the children involved were dead. Susan D'Arcy believes that her daughters leukaemia is directly linked to the Sellafield plant. Her daughter Gemma, is one of the three children in one school to have contracted the cancer in the last two years. The other two children died. Gemma who is six years old, is at present in hospital following a bone- marrow transplant. Gemma's father, Stephen D'Arcy, has refused to support his wife's test case against BNFL saying, "It's a bit like biting the hand that feeds you." BNFL employs around 33% of the population of the area. At Sellafield alone, there are some 14,000 people working at the plant, and thousands more depend on it for a living.

In a follow-up story on the study on Sunday after it was released, *The Guardian* ran a headline saying "Cumbrians Calm on Sellafield Report". But the article itself contradicted this. One person interviewed, Christopher Merlin, who had already begun a lawsuit against BNFL after plutonium from the plant was found in his household dust, predicted it would have a "disturbing effect on marriages in the area." Another man said, "I would be worried if I were starting a family. I've worked there for four years." Even a woman who said, "yes, people were taking it calmly and there was," she thought, "no panic", went on to add, "Yet I think young people are bound to think twice about whether there is any risk." Let's hope the authorities who set dose limits think twice, too.

Source: WISE News Communique 326
The Economist March 10, 1990
Peace News February 23, 1990

The discovery of a clear statistical link between the exposure of men to excessive radiation and leukaemia in their children is a calamity of dreadful proportions for those directly affected. The anguish of a father of a child suffering from this serious and sometimes fatal disease will be increased immeasurably by the suspicion that the origin of such suffering may after all be in himself. Such families need and deserve all the support and sympathy a compassionate society can muster. So serious are the implications of this discovery that the only sound basis for public policy in response must be to act as if the suspicion was already proved. Further research is essential, but it must not be used as an excuse for delay. The investigation by Professor Martin Gardner of Southampton University is evidence enough for action. It is already being hailed as a model of its kind, and may become a classical demonstration of the detective power of environmental epidemiology, the science of investigating statistical patterns of disease in pursuit of clues to medical causes and effects.

The implication must be faced, painful though it is, that any man who has been exposed regularly to radiation in the course of his employment may run some risk of fathering children who may eventually contract leukaemia. One of the first priorities of research must be to identify that group at risk as accurately as possible, for there must be thousands of men whose work brings them into contact with radiation who will today be fearful about their own families. They need reassurance as fast as it can be obtained, based on solid scientific investigation. Meanwhile the entire nuclear industry is faced with a real emergency. Radiation safety levels will have to be reviewed once again, and almost certainly substantially lowered. This is also a case where it will be not sufficient to await the final dotted T or crossed T in the laboratory, but where the only right basis to proceed for the time being will be to assume the worst.

The Times (London) 16.2.1990

Events

Talk by Dr Rosalie Berteli

On 28th February, 1990 a lecture on the "Health Hazards of Low Level Radiation" by Dr Rosalie Bertell was organised in the Indian Merchants Chamber Hall in Bombay. The organiser was F.I.AM.C. Bio-Medical Ethics Centre of Bombay. The lecture was co-sponsored by a number of organisations including *Anumukti.* Dr Biswatup Bannerjee a physicist from Tata Institute of Fundamental Research presided and Mr Justice Y.V. Chaudrachud - the former Chief Justice of India was the chief guest. The lecture was attended amongst others by many scientists, medical personel and journalists.

Dr Rosalie Bertell who is the author of *'No Immediate Danger — Prognosis for a Radio-active Earth"is* a very famous figure in antinuclear circles all over the world. Two years ago she was awarded "The Right Livelihood Award"— the "Alternative Nobel Prize" for her pioneering work on effects of low level nuclear radiation. She has been a fighter for human rights especially for the rights of the weak and the dispossesed Trained originally as a statistician she presently is the President of the International Institute of Concern for Public Health. She has a special relationship with India since she is involved in a long-term study of the effects on the naturally occuring (high) low level radiation in the monazite sands of Kerala.

During her talk she sighted many studies in which she herself had been involved to stress the pernicious nature of low level radiation. The point she stressed was that increasing radiation pollution is a form of random murder. What we are actually doing is to deplete the strength of the gene-pool. In the long run we will be producing children who are less able to cope with pollution than were their parents while at the same time we're degrading the environment so that they have more to cope with.

Of special interest were her preliminary findings of the study of 40,000 fisherfolk and a comparable control group living on the sands in Kerala. She confirmed that there had been an increase of three to four times as much in congential diseases like epilepsy, cleft lip and pallette, infertility, Down's syndrome etc.

She also talked on the role of standard setting bodies like ICRP (International Council for Radiological Protection) which though they recognise the various ill effects on biological systems of radiation like injuries, general lowering of W.B.C. counts, cataracts obesity, impaired fertility, shortened lifespans, increases in cardio-vascular-renal diseases as well as in autoimmune lymphoid diseases; only take into consideration fatal tumours while setting standards.

Medicos Say No to Nuclear Energy

Medico Friend Circle (MFC) in its XVIth annual meet on "Radiation and Health" held at Gandhigram Rural University from 26th to 28th January resolved to oppose the production and use of nuclear energy as being too hazardous for the health of human beings and to demand that existing nuclear facilities be de-commissioned and no new nuclear plants be built.

The discussion in this meet was divided into four broad areas:

1) Basics of radiation and health and the experience of nuclear power plants;

2) Health-hazards of common radiological investigations;

3) Food irradiation;

4) Other sources of radiation from consumer products - Electronic Display screens for instance.

Most of the discussion and background material was focussed on the first area; a clear consensus also emerged.

During this discussion, it was pointed out that authorities allover the world have concluded that the quantum of radiation, how so ever small, invariably cause damage to human issues and that there is no level of radiation that can be considered safe. Production of nuclear energy damages the health of the people through exposure to ionising radiation at all stages of operation. Mining and milling, transport of radioactive material, burning of nuclear fuel in the reactors etc. cause radioactive contamination of the environment. There is enough scientific evidence to this end. Moreover what is of grave concern is the nature of the health hazards caused by ionising radiations which could to the foetus, genetic mutation after many generations and would be carried over to future generations as well.

The MFC meet underlines the special significance of these health hazards which would affect the very quality of human race in the future generations to come. Added to this is the predicted adverse effect on the power to resist infectious organisms and other stresses. These alarming health hazards are reasons enough to outright reject nuclear power.

The participants of MFC meet emphasised that apart from these major health hazards, there are many other important health problems like increased incidence of allergies, asthma, high blood pressure, hypothyrodism, reduced fertility, spontaneous abortion etc. Thus on health grounds alone, nuclear energy is to be rejected in absolute terms with little need to base our judgement on the comparative analysis of health hazards of different sources of energy. Any source of energy which threatens the very survival and quality of human species has to be rejected and human society must find a model of development compatible with safe energy sources. During the course of the discussion it became clear that the health hazards of nuclear energy cannot be minimized despite claims to the contrary. Above all, the problem of safe disposal of radioactive waste for thousands of years has yet to be solved.

Today, nuclear energy constitutes only 1% of total electricity produced in India, shutting down of nuclear power plants will thus not result in a crisis on the energy front. The 1% deficit for which the nuclear energy is being produced can easily be overcome by saving electricity losses in transmission.

The MFC meet has also drawn attention to the health hazards of repeated exposure of pregnant women for prolonged periods to visual display terminals (Screens) attached to Computers.

The MFC meet, while affirming the well established immense value of radiological investigations has drawn attention to the fact that additional cancers do in fact occur due to exposure to X- rays. The incidence of additional cancers is extremely low and depends upon the age, sex of the person exposed and the quality of radiological apparatus. It has been estimated that in case of adult male persons exposed to these X-rays, there would be 15 additional cancers per million X-rays. Compared to the number of lives safed and diseases diagnosed this risk is extremely low. But nevertheless it follows that X-rays must be kept to as minimum as necessary and secondly all the precautions necessary to maintain the X-rays units properly have to be meticulously followed. On both these counts the situation in India especially in Taluka places etc., is much worse than in the developed countries. Screening machines are much more hazardous because their exposure is many times more and hence it should be restricted to the absolute minimum. Atomic Energy Regulatory Board must exercise its powers to regulate the quality of radiology units.

War Resisters Meet

The regional conference of the War Resisters India (West) took place at the Sampoorna Kranti Vidyalaya in Vedchhi between 10-13 March 1990. It unanimously adopted the following resolution:

"We the peace activists and constructive workers of the western part of India are deeply concerned about the increasing violence and militarisation in the subcontinent. We firmly believe that it is our responsibility to take such steps that would help in bringing about mutual understanding and peaceful relations between the peoples of this region. Our objective is a world without war, and it is with that spirit that we state the following:

"As the Indian government has repeatedly stated that it is committed to giving priority to friendly relations with her neighbours, we are disturbed to learn now that the Prime Minister has announed an increase in the defense budget whereas the general trend the world over is towards reduction of arms. Therefore, we urge our government to start cutting military expenditure in order to build confidence in South Asia."

"Some recent statements by the government referring to its intention to go to war if necessary as well as the appointment of a defense minister who is a strong protagonist of nuclear weapons are not in keeping with the spirit of the processed policy of reconciliation. This has only served to vitiate the atmosphere in the region.

"We welcome the announcement that at last the Indian troops will now be withdrawn from Sri Lanka and we hope that in future no action will be taken which may be considered a further interference in the affairs of Sri Lanka and for that matter any neighbour country. The future of the people of this region is closely linked with the availibility of water. This should encourage the governments to find amicable solutions to water disputes, for example sharing of Ganga waters between India and Bangla Desh."

"We on our part attach the utmost importance to these issues and are determined to continue our struggle for peace and friendship with our neighbours. We hold that the future of India is linked with the future of her neighbours."

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A Passing Opportunity ?

Energy situation in the GDR and future possibilities

Times are changing rapidly in Eastern Europe. Today, policies regarding the future are no longer decided by a small group of rulers. The people have demanded their rights and soon in all Eastern European countries there will be elections. The tasks of the new governments in the fields of environment and economy will be hard.

The former government of the German Democratic Republic has left an economic and environmental disaster behind it.

In the south of the GDR lie brown coal deposits. It is the only raw material available in the country for energy production. The quarrying of this has destroyed the surrounding area completly. In 36 coal-mining districts 320 Mio tons are quarried per year. That is more than in any other country of the world. The cost to nature and to the population of the area are enormous: 3,000—4,000 ha dead landscape with huge craters is the result of one year's operations alone. 30,000 people have had to resettle, 75 villages have been exterminated, rivers, roads and railroads have had to give way before the gigantic quarrying machines.

70% of the energy supply in the GDR comes from this brown coal. In 16 mainly obsolete power stations more than 80 % of the delivery is burned. But the bigger part of this amount emits through the chimnies and polluts the environment. There are no dustfilters, no installations to cut the sulphur dioxide emissions.

Sebastian Pflugbeil, member of the opposition group "Neues Forum" and a physicist says that three quarter of these power stations should be pulled down because they are in such catastrophically bad repair. He points out that the GDR has the third highest energy consumption per head in the world - a consequence of the old techniques besides the waste of energy everywhere.

So, what to do? The intermediate government had recently made first attempts for a change and reduced the mining of brown coal by about 50-70 Mio tons. But this alone can not be the solution.

In the Federal Republic of Germany the nucleocrats and businessmen of the atomic industry are already on the stage hoping to sell a product which has seemed to be "out" in their own country. In the West it has become more and more difficult to install new atomic power plants: the raised awareness of the population, the opposition movement, the Chernobyl-accident, the increasing costs of this energy resource have all led to a situation where no politician wants to take the risk of ordering new constructions. Now the atomic industry sees its chance in the East. Talks between nuclear experts in the GDR and the West German companies have already taken place.

Today, in the GDR at most 10% of the energy output comes from nuclear plants. Five reactors are on line, four of which are Soviet 440 MW reactors installed at Greifswald. Three others near Stendal are still under construction after 17 years. Recently it has become known that there was a near core meltdown at the new fifth block of Greifswald in November 1989 and a very severe accident in 1976 (see following story).

There has hardly been any resistance against the reactors in the GDR. The pressure from security forces and the ruling party was too strong and the existing environmental groups were faced with more evident abuses: air pollution, dirty rivers and destroyed environment. But if the new elected government decides to extend the nuclear programme there will be probably be more turmoil - the government has to calculate that the times of a quiet citizenry have passed.

It is ironical that just the members of the former government party SED got support of the conservative federal government of West Germany on this issue. In the case of atomic energy the old rulers seem to be the most reliable partners for the western enthusiasts of atomic power.

The common man in East Germany would perhaps prefer some radiation to the terribly bad air but for the environmentalists and most of the opposition groups in the country the choice between the alternatives "brown coal" or "atomic power" is like "the choice between plague and cholera".

The environmentalists have other ideas about future energy politics: they want to overhaul the existing brown coal power stations, improve the industrial and household techniques and put the main emphasis on energy saving possibilities. According to Mr Pflugbeil an extensive energy saving programme is the solution because the opportunities to save energy are more than good. Besides, the brown coal resources are becoming less and less, their quality becomes worse and the quarrying gets more difficult. On the other hand the construction of new nuclear power plants takes a long time (about 10-20 years) - too much time and too much money for an economy in difficulties. The huge expenditures which are necessary for the construction of atomic power plants would divert money from more sensible and urgent activities.

On the 18th of March the first free election in the GDR have taken place. The conservatives have won. This means that the unification of Germany will be quickly forced. Whether the new government with the help of the coservative government in Bonn will be willing to start a reasonable energy policy without nuclear power plants is now again in question. But, the environmentalists too will unite. And they have the better arguments...

Carolin Bender, Bonn, West-Germany

Notice Board

"Safe Energy and Environment"

A new quarterly journal "Safe Energy & Environment" will be coming up from April, 1990.

In Calcutta, a citizen's convention on April 30, 1989, to commemorate the Chernobyl Day, stressed the need for an organised effort for the collection and dissemination of information on the dangers of nuclear power and people's movement against it in particular, and environmental and energy issues in general. The journal 'Safe Energy and Environment' is a step towards the realisation of the demand of the convention. At present, we are working with a handful of activists, greatly limited resources and a tiny network. What we want to make is a modest beginning. The future depends on your active co-operation and support.

Yearly subscription rate:
Personal Rs. 20/ ; Institutional Rs 40/-

Contact: Pradip Datta,
Publisher Safe Energy & Environment,
28, Nazrul Park, P.O.: Aswininagar,
Calcutta-700059

Trichur Antinuclear Convention

The recent session of the Indian Science Congress has endorsed the demand that two 500 MW nuclear reactors be located in Kerala. There is vigourous campaining canvassing for it in the political arena also. Hence we are organising an anti-nuclear convention in Trichur on 26th April to inform the public and form a strong and united resistance to the proposed project.

Contact: K. Aravindakshan
Walden Post Eravu 680620
Dist: Trichur, Kerala

India's Nuclear Options

27,28 & 29 April Bangalore

The National Front government's budget provide for further increases in allocation for defense and the Department of Atomic Energy.

When tensions are fast disappearing in Europe, in our region the threat of war and momentum towards the building up of large arsenals continues despite glaring poverty and unemployment. The basic priorities are side-stepped due to a misconception of our real security needs.

From time to time there are newspaper reports about exercising the nuclear option - pointing towards the alleged secret weapons programme of Pakistan, while conveniently overlooking the fact that the Minister of State for Defense, Dr. Raja Ramanna along with the present chairman of the Department of Atomic Energy was responsible for the 1974 Indian nuclear explosion.

In August the United Nations will be reviewing the Nuclear Non- Proliferation Treaty. What ought to be India's position on it?

SAARC has become a reality. But the peoples of South Asia are being kept apart - in the interest/defense of their nations.

When most countries with nuclear power as a major part of their energy source are abandoning nuclear energy, India is planning to expand in a massive way. This expansion involves abandonment of long professed goals of self reliance and importing of reactors from Soviet Union and France.

To discuss these and other related issues, it is proposed to hold a three day seminar near Bangalore at the Ecumenical Christian Centre at Whitefield. The seminar which will be residential is being jointly organised by the following organisations:

Documentation & Dissemination Centre for Disarmament Information, Bangalore;
Ecuminical Christian Centre, Whitefield;
Friends Rural Centre, Rasulia, Hoshangabad;
Institute for Development Education, Madras

Contact: Hemachandra Bassappa.
21. Railway Parallel Rd.,
Nehrunagar, Bangalore 560020

Will Koodankulam Be Known as "Chernobyl South"?

On 24th of November 1989, Central Europe stood at the edge of a nuclear disaster comparable to the Chernobyl disaster of 1986. Recently released reports, suppressed by the East German authorities, reveal that a nuclear power plant in Greifswald suffered a near core melt-down.

In order to test the emergency switch-off system of the new fifth block of the reactor, three out of the six cooling water pumps were switched off. Instead of the expected automatic switch-off, the fourth pump broke down and the reactor went out of control. When the crew finally succeeded in switching the reactor off manually, ten fuel elements were damaged - a local meltdown. The triggers to the automatic switch-off were, according to an official investigating commission, sticky contacts of relays which were sloppily constructed, as was the rest of the Russian built reactor.

This accident is only the latest in a series of dangerous and highly dangerous incidents:

In 1974, only hastily spread jumping-sheet prevented some control rods from falling into the fully loaded centre of the reactor.

In the mid seventies all main water pumps broke down. Workers had forgotten to reinstall six small iron lids during a checkup.

In 1981, de-ionized water got into the active zone of the reactor. The speed if the fission reaction increased and the temperature rose out of control.

In 1976, following a fire within the reactor, the complete cooling system of block 1 broke down. Only the coincidence that one of the six emergency cooling pumps was connected to the neighbouring reactor prevented a core meltdown.

The everyday conditions prevailing in the plant present an even more impressive list. The plant was kept connected to the grid under nearly all circumstances. Drunken staff, a leaking and unstable reactor building, paint covered finger-wide welding seams, missing containments, missing replacement and construction materials, chaos in cable connections, sinking foundations and radiation levels 10,000 times in access of design specifications. In order to keep all these skeletons under cover, some 40 people from the Stasi (the dreaded secret police) were posted at Greifswald. Workers and staff were intimidated, while at the same time wages were twice as high as compared to other industries. For decontamination work soldiers were often used. Chromosome damage was discovered in six workers. Workers at the plant were conversant with its obsolete equipment that often broke down. Privately they referred to the plant as "Chernobyl North".

Editors Note: The reactors to be installed at Koodankulam are the very same VVER reactors as at Griefswald.

Reviews

Narora - The Untold Story

We have often lamented the paucity of information regarding the Indian nuclear programme. *Narora — The Untold Story* is an attempt to bridge this great chasm in information. It is published by the Network to Oust Nuclear Energy (NONE)— a group of young activists from Delhi who have made sincere efforts at educating public opinion by conducting slide shows and workshops in a number of colleges in Delhi, Aligarh, Bulandshahar and other towns surrounding Narora. This 24 page booklet contains many pictures of the people displaced by the plant and maps of the surrounding areas. The price at Rs 10 might seem somewhat excessive at first glance but as a small token of one's support for the movement it is indeed a very reasonable price.

Extract

Knowledge of the **plant and of nuclear hazards**

The knowledge the villagers have about the plant is partial and in many cases, distorted. Evidently, Those who bear the brunt of dislocation are not considered important enough to be briefed about the kind of work the plant does. Worse still, they have not been given any information at all about what they are to do in case of an accident.

Some who work in the plant have a clearer idea about nuclear energy. These are also the ones who mention accidents, and incidents of workers being exposed to radiation. We cannot verify these stories since the DAE does not give the public access to such information. However, we have retained reports of such incidents simply to point to the workers' knowledge about the issues involved.

Name: Om Prakash, Village: Ramghat
They told us that electricity generated in the plant releases a poisonous gas. The gas will harm us, our grains will get spoiled, water will get affected, we will die..."

Name: Yadiram, Village: Ramghat
"Buffaloes grazing near the plant had died...

Name: Rambharose, Village: Ramghat
"DM Sahib told us that gas will be released from the plant so we should leave our houses. What type of gas it is we don't know..."

Name: Kalawati, Village: Ramghat
"We were told that our grains will get poisoned, grass will dry up due to the poison, animals, plants all will die... But our cattle still graze near the plant. What to do? There is no other place where they can get anything to eat..."

Name: Kumkum, Age: 10 yrs.,
Colony: Bijaun Nayi Basti
"Our village has been abandoned, that is why we are here. A power house was being made there. When it started working, we would have died. My father told me this."

Name: Unknown (Woman),
Colony: Bijaun Nayi Basti
"They told us that a power house was being built. The electricity will be made from the rays of the sun god. What these rays are we don't know... We were told that if we get exposed to radiation our limbs will be deformed, or our babies will be born deformed. That is why we were settled 3 miles away from the plant..."

Name: Ramwati, Colony: Bijaun Nayi Basti
"We have not been told what we are to do in case of an accident in the plant. They said that if something happens we will be taken out of the area in buses."

Name: Jaisingh, Colony: Bijaun Nayi Basti
"...To make us leave the village they told us that there can be an explosion like Bhopal."

Name: Bankelal, Colony: Bijaun Nayi Basti
"Some men in the plant have got radiated. Pukhraj's whole body is useless. He becomes like a statue and starts shivering."

Name: Unknown, Colony: Ambedkar Basti
"In this plant, electricity will be generated through the eclipse of the sun and the gas which will be produced inside can harm us if it is released."

Name: Unknown (worker at the plant),
Colony: Ambedkar Nagar
"The boiler line taking heavy water to the turbine burst recently. We welded it... The plant was shut down for a month. When the Prime Minister came to inaugurate the plant it was not working... Many workers have died because of radiation. When the contractors get letters from their homes, they reply that these men have left the plant and their accounts have been cleared."

Name: Gulab Singh, Colony: Ambedkar Nagar
"I work in the plant, I do inspection work. When the plant starts, radiation can spread in the nearby areas and the villagers will suffer... because of radiation there can be a loss of blood in the body, pain in arms and legs and if a person gets a large dose of radiation he can die too... There are many labourers In the plant who do not know anything about radiation. .. one man got radiated and as soon as he stood up, he started shivering."

Name: Ranvir Singh, Colony: Ambedkar Nagar
"I have been working in the plant since the past 5 years... About a month before Rajiv Gandhi came here, there was a heavy water leakage. The heavy water was in a tank, which was opened by mistake. When we learnt about the leakage everyone ran away from there...There was no one in the control room...Finally to clear it up, labourers from outside were called in, on daily wages, they were paid around 20 to 25 rupees."

Name: Unknown (worker at plant),
Colony: Ambedkar Nagar
"When someone is exposed to radiation, then if he is normal he is put into hospital, if he is seriously affected he is put behind a glass sheet. If his family comes to see him, they look at him through the glass and come away."

Name: Unknown, Colony: Sundamagar
"We were told that the plant makes papads, and smoke comes out of these. This smoke can damage your eyes."

Name: Mir Kasim (worker at the plant),
Colony: Sundamagar
"The day after Rajiv Gandhi came to start the plant, there was a fire in part of the plant. I was working inside, welding something.. I came away. A friend who was there is in hospital now."

Strategy for Survival

"What is the relevance of a peace movement for India?" This was one of the most challenging questions during the recent regional meeting of the War Resisters of India in Vedchhi. The question was occasionally raised, but more often it was inherent in remarks concerning the priority of work on sustainable energies, organic farming, environmental protection, etc. "We have got so much to struggle within our dialy sphere of work that there is little scope for a national or international peace initiative," was the consensus among some of the activists. Only slowly it became clear that exactly these daily struggles are steps towards a liberating peace.

Towards a Liberating Peace is also the title of a new book trying to provide a "coherent shared theory which illuminates hidden intolinkages in dear and understandable terms." An international team of scholars under the direction of social scientist Rajni Kothari and within the framework of the United Nations University's Programme on Peace and Global Transformation has prepared the study. It focusses on the issues of militarisation, worldwide economic cirisis, conflicts over resources and human and cultural rights.

It is interesting to read the publication and to know more than the authors possibly could have known: The group's work was completed in 1989 and only the last months' developments have opened new perspectives on the dynamics of world history. Much of what is said in *Liberating Peace* anticipates the recent developments, for example the strong influence which consumerism exerts on non-Western societies, or the impossibility of maintaining economic and political independence in the neighbourhood of a superpower (see Nicaragua).

Other hopes for tendencies in favour of sustainable and peace promoting life styles have been disappointed, as for instance the defeat into near irrelevance of the ecologically and socially conscious dissidents in East Germany's polls or the rising conservatism and chauvinism in Europe and South Asia. The political and economic failure of the socialist systems, which the authors recommend as positive solutions to some aspects of the economic crisis, makes the reader doubt the assessment. But it is easy to know better now.

The book at times, reminds one of the style of the Brandt report: long enumeration of global problems and lists of recommendations for a reorientation. Here the critical reader will not find much new information.

But the authors do more than that when they show how militarisation is one cause behind the distortion of the economy as well as of the political process. An elite which has accepted violence as a means to defend its way of life, would prefer to alot government funds to research and production relevant to the military not regarding their long term destructiveness. A large military apparatus, nuclear weapons and arms industry even in peace times breed secrecy and curtailment of civil and democratric liberties.

The authors demand a global reduction of military spending and arms production as the only way to counter the economic and ecological crisis. They point out that the North only can produce new weapon systems because the South buys its products and thus contributes to the market feasibility of the industry. However, one wishes that they also had discussed the contribution to the arme bazaar of countries like India, Argentina or South Korea.

Prof. Kothari's well-known pen is felt throughout the book: issues of peace and global transformation are analysed in relation to the role of the State. The nationalist State is denounced and hope is sought from efforts at the grassroots. If the movements give up their regional and national isolation they would be able to develop strategies for a transformation of the State. *Liberating Peace* is meant for them and hopefully would stimulate the discussion about the critical movement's role in politics and society.

Rajni Kothari, Richard Falk, Mary Kaldor, Lim Teck Ghee et al.

Towards a Liberating Peace

New Delhi: Lokvani: Tokyo :

The United Nations University 1989

LETTER BOX

There are just a few general remarks I would like to make about Anumukti. Of course the magazine is informative. The piece on the French nuclear programme was one such. But there are finer, more intangible reasons that speak for Anumukti. After all information can be gathered from other sources too.

Magazines like Anumukti are precious fragile things that need all the care that humanity is capable of mustering, to be bestowed on them. Anumukti's battle is a losing battle. I don't think that any government in the world either cares or dares to uphold environmentalism or denuclearisation against the claims of industry and capital, aided as both are by science. This combine is ruthless and invincible I think, and it is going to see to it that it remains invincible. Power after all has never been given up for idealist or ideological considerations.

But every doomed battle represents a worthy cause. In today's world environmentalism has the only rhetoric that makes sense. All the known causes - culture, religion, nationalism, communism, feminism etc. -- are based on exclusiveness of one kind or another - geographical, territorial, sectional and so on. This kind of exclusiveness has become out of date in today's world of time-compressing locomotion.

Environmentalism has no totems. It upholds the biological foundation of life, in which every division brought about by man-made civilizations and cultures, disappears. We need this sweep of vision today, and the breadth and spaciousness it spells, to regain the wholeness taken from us by exploitative and undisciplined technological growth.

It is unlikely, as I said, that this vision and spaciousness will be given for the asking, or that they would pass into unconcious and established ways of thought and being or that they would ever be anything more than concepts. But that is precisely why Anumukti and magazines like it have to be supported. The saying of unrealizable truths is important. I would like to be amongst those who at least clap for the sayers even if they can't be sayers themselves.

Raji Narasimhan
B107 Gulmohur Park, New Delhi 110049

In the last issue of PPST Bulletin, there was a long article indicating that the Indian nuclear energy programme was costly, inefficient and made no provision for the disposal of wastes. I had sent this article to a friend of mine in the United States and he disagrees strongly with this view. (His comments are enclosed)

As you know this is a very disputed matter and it is not easy to understand, why when nuclear energy can save fossil fuel and is yet being followed all the world over, India should take a stand against its introduction and continuance. The late Sir Homi Bhabha, and our scientists like Dr Raja Ramanna and Dr Srinivasan also hold the same view. Perhaps you might like to consider all these facts and not take a completely one sided view of this disputed matter.

R.K.Patil
Civil Lines, Nagpur

I am from Kutch. Kutch is in comparison to other parts of Gujarat a very dry and thirsty area. To such an arid land the gift of water would indeed be a great blessing.

But our tiny planet Earth has suffered much from the depradations of the pleasure-seeking 'developers'. They have polluted entire creation and are still continuing to do so today. Any attempt to halt this plunder is welcome and those who raise their voice are only performing their sacred duty.

There can be honest differences of opinion on issues but amongst those who protest this terrible disbalancing of the harmony of nature there are many who are honest and pro-humanity. I myself personally know some of them.

I believe that seeing the high level of feeling raised on this issue let the dam be built and whatever be the outcome we shall share the benefits and the harm equally.

But those farmers who shall be receiving water from the dam, why cannot the rich amongst them share half their land for those who are being displaced by the dam? It is only in this atmosphere of sacrifice that the passions of the protestors can be calmed.

The waters of the Narmada belong to the nation. It is only when their distribution is on the basis of social justice that a new and healthy atmosphere can be built up.

It is only when we (the supporters of Sardar Sarovar) can listen with respect and an open mind to the opponents, that the passions of 'WAR' can be converted and the Narmada Abhiyan can become a new beginning.

(Translated from Gujarati)
Manibhai Sanghavi,
Shri Gram Swaraj Sadaneelpar, Kutch 370165

Subscription Rates:

Rs.25/-per year South Asia

U.S.$ 15/-per year air mail overseas
(Rs.2007-per year if paid for in India)

Please add Rs.6 for cheques

Editor: Surendra Gadekar

Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to

Editor Anumukti,
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat Printery, Ahmedabad.

PRINTED MATTER BOOK POST

ANUMUKTI

A Journal Devoted To Non-Nuclear India

Volume 3 Number 6 **June/July 1990**

Charabal is a river of central India. It is one of the very few Indian rivers which flows northwards. Its awe inspiring ravines are famous. The dacoits who inhabit these ravines have left their mark on our psyche. Sometimes as romantic characters fighting the injustice of the state, but more often as particularly blood-thirsty specimens of (in)humanity.

But Chambal is a river which meanders through many different terrains. And the tale I want to tell is of a different Chambal. A river of sorrow. A polluted river bringing death and disease to her children. Tamlao, Jharjhani, Deeppura, Bankheda, Eklingpura ... are names of villages situated on or near its banks a few kilometres this way or that from the reactors of the Rajasthan Atomic Power Project. During the sixties, a number of dams were built on the Chambal creating vast man-made lakes - Gandhi Sagar, Rana Pratap Sagar, Jawahar Sagar. A number of these villages had to resettle as the waters inundated their lands. But those were days of innocence. The villagers were told and they believed fantastic tales of the bright future that awaited them in the new dawn of development. Electricity, roads, schools, hospitals, jobs for everyone...

Well, years passed. The dams got built. With all the lovely cooling water around, nuclear power plants soon arrived. High tech progress took these poor folk by their hands and led them to the promised land.

But what did they find there after seventeen years? Jobs? The youth have now been forced to organise themselves into a *berozgar sangha* (unemployed's association) to agitate for jobs. Electricity? The applications of farmers for an electric connection are lying unattended for ten years. Roads? Even the officers of the nuclear power station are willing to admit that roads are in scandalous disrepair. They won't be able to evacuate people in a nuclear emergency during monsoons since even their jeeps are unable to get to most villages. Health care? For any serious complaint people have to go to Kota (50 km away).

The promised land is a land of despair. It is a land of mysterious tumours and malformed children (See Chernobhata? on page .3) Seeing these innocent children sacrificed at the alter of development one begins to wonder if the really bloodthirsty dacoits live on the banks of the Chambal or stalk the corridors of power in Delhi and Bombay.

An Account of Ourselves

"You don't take any advertisements, nor government help, nor funds from foreign funding agencies, then how does Anumukti survive?" I am often asked such questions by friends and fellow publishers of small magazines. Recently I was startled to hear that a story was doing the rounds that Anumukti was sustained by funds from the War Resisters International (WRI). To put such doubts and speculations at rest I am giving below Anumukti's accounts ever since its inception three years ago. We are very grateful to M/s. Chandrakant & Sevantilal Chartered Accountants, Bombay for having audited our accounts.

In December 1985, WRI had its three yearly gathering at Vedchhi. Part of the funds for this gathering were raised locally. However, after the gathering was over it was found that some of the money was left over. A resolution was passed by the organising committee to the effect that these left over locally raised funds be utilised by the Gujarat Anu Urja Jagruti in its antinuclear programme.

This money along with other locally raised funds was used in organising the 'Atom in India' seminar in Bombay in August 1986. At this seminar it was decided to have a journal which could serve as a means of communication between different antinuclear activist groups and educate people on these issues. Thus, Anumukti was born. As would be apparent from the accounts, Anumukti has never taken any money from these left-over WRI funds. The reason why Anumukti is able to manage on a shoe-string budget is because it is a purely voluntary effort. Sampoorna Kranti Vidyalaya, an organisation which does not take in any foreign or government funding owns Anumukti and underwrites any losses it might suffer. This safety net is a great help, though it is our effort to keep the Vidyalaya's contribution to a minimum. The total shortfall over three years has been Rs. 872.60 only.

Anumukti has been lucky that from time to time people have generously come forth and offered it assistance in the form of donations of money, equipment and labour. We are extremely grateful to Shri.l.J.Desai for having allowed us unlimited use of his personal computer. This has allowed us to typeset all the matter ourselves. Shri Bhaidas Parikh and the Parijat printery at Ahmedabad have helped us in greatly reducing the paper and the printing costs. Other friends have given donations to tide over emergencies.

Statement of Accounts

Income

1987-88	
Subscriptions and Donations	8,664.75
Vidyalaya Contribution	1,132.35
Total	**9,797.10**
1989-90	
Subscriptions	13,215.13
Donations	3,581.00
Total	**16,796.13**
1989-90	
Subscriptions	15259.27
Donation s	2,400.00
Vidyalaya Contribution	3,321.28
Total	**20,980.55**

Expenditure

1987-88	
Printing	**7,975.00**
Postage	**1,822.10**
Total	9,797 .10
1988-89	
Printing	8,974.13
Postage	4,241.00
Surplus	3,281.00
Total	16,796.13
1989-90	
Travelling	**3,190.75**
Printing	**9,513.00**
Postage	**7,170.80**
Stationery	**692.00**
Bank Commission	**414.00**
Total	**20,980.55**

CHERNOBHATA ?

This is a report of my first impressions as a doctor of the situation existing around the Rawatbhata reactors. It is not and neither does it purport to be a report of a scientific survey, though I feel that there is a great need for such a survey to be conducted immediately.

First a little geography. Rawatbhata reactors is something of a misnomer. The reactors are situated on the lands of a village called Tamlao. Rawatbhata is where the colony of the workers working in the reactors is situated and is about 11 km from the plant site in a northeasterly direction.

During the cycle rally, I was on a motorcycle and therefore reached Tamlao before the rest. To escape from the heat I took shelter in a small roadside shop and began talking to the people there. Some children were playing in the front yard. At first site they looked just like any other poor children of the region. But on closer observation I noticed that many of them seemed to have difficulty in movement. I called them over and examined them. Many of them had muscular weakness. Two had bone tumours. Just then I noticed that a shopkeeper across the road had a thyroid tumour and the shopkeeper next to him had a cyst on the cheek. An old man had a nearly two inch diameter cyst on the cheek.

I studied medicine in Calcutta. But even there I had never seen so many patients with tumours in a single day. On talking to these people in Tamlao I found that almost all the symptoms had appeared after five or more years of the reactor's commissioning.

The next day we were in Rawatbhata and heard that a child had been born recently with talipice (crooked legs) in a colony of cattle herders. We went to see him. While there his mother told us that her next door neighbour had a six month old baby boy with the same defect. When we went there, the lady said, "Oh, there is another seven month old girl just seven eight houses away who too was born with crooked legs. Nearby in another colony we saw a two year old boy with the same problem and another two year old who had been born without any toes on both his legs.

Later we went to see Jharjhani village. This village is about eight to nine kilometers from the plant site in a direction opposite to Rawatbhata colony. The villagers claimed that at least 25 days a month the winds blew towards them from the plant. There every one I met, and I met hundreds of people, complained of stomach pains. There was a girl born here without one ear and another two year old who did not have a hand since birth. Again there were number of children with tumours. A very large number had polio. There were two orphan children both with large lumps in the abdomen. Many women and men complained of sterility.

On talking to shepherds I learnt that they have been seeing similar problems in their herds for a long time. One person told us, "You can go and check from Panchayat records that this village ten years ago had 5,000 goats and sheep but today there are hardly 500. I have had goats born with three legs by the dozen."

I have been studying about the health effects of radiation for the last few years. I knew beforehand that there could be various kinds of effects. Because of long term ingestion of radionuclides immune mechanisms would be disturbed and therefore I was mentally prepared to see increased incidence of different diseases, some cancers and genetic defects. But even in my worst nightmares I could never have imagined that I would see so many in so short a time in such a small population.

I talked to the authorities of the nuclear power plant. They said that the amount of radioactive releases from the plant were so small - just half of one percent of the natural background - that it was inconceivable that these diseases and deformaties were due to radioactive discharges. They were inclined to blame air pollution and adulturation in cooking oils for the problem. However, enquiries revealed that there are no factories or industrial establishments of any kind other than the nuclear power plant and the Department of Atomic Energy operated heavy water plant anywhere in the vicinity to cause air pollution.

From some workers 1 beard that there had also been a number of cases of cancers and birth defects amongst the plant workers and their children but I was not able to see their health records to confirm this.

The number of crippling deformities and handicapped people around Rawatbhata that I saw is certainly abnormally large. I doubt that radiation in low doses can cause this much damage. There have been no reports of such teratogenic effects in the vicinity of other operating nuclear plants anywhere else in the world. Although recently there have been some newspaper reports indicating increasing incidence of such effects around Chernobyl. Therefore, I suspect that the 'routine emissions' from Rawatbhata have been much larger than what is admitted by the authorities. Or else there have been accidents and 'leaks' during its seventeen year history that the authorities have managed to hide from the public. Whatever be the cause, it is imperative that there be an immediate scientific investigation of the entire area. Even if there are no baseline health data for comparison, and it is criminally negligent on the part of the atomic energy authorities to have polluted the environment without having first collected baseline data, they and the government should immediately do comparison studies with areas without nuclear contamination and publish their findings. It is also necessary for independe scientists to conduct their own investigation.

Baby born without fingers.

Girl born with deformed ear.

Seeing the condition around Rawatbhata I felt that here we are building new reactors in Gujarat, Karnataka, Tamilnadu, Andhra Pradesh and other places in the country. Will the same scenes be repeated in all these places a few years after the reactors begin operation? Would we see effects first in small domestic animals like goats and sheep and would there be deformed babies before even one generation passes?

Every citizen of the country needs to become aware of this danger. Now! If we want to save our land from this hell which goes on generation after generation the time for action is before these plants begin operation. I urge doctors, scientists and social workers living in the vicinity of proposed plant sites to beware of this terrible danger. They should go to Rawatbhata and look for themselves and take action now so that a similar situation can be avoided in the future at other places.
Dr. Sanghamitra Desai Gadekar
Sampoorna Kranti Vidyalaya,
Vedchhi

Ek Ya Do Bus?

The Indian navy may have received a second nuclear powered Charlie I-class cruise missile submarine from the Soviet Union because the first submarine it leased may have experienced radiation problems, according to *Jane's Defence Weekly.* The first submarine called the *Chakra,* was commissioned last January. The second is reportedly named the *Chitra.* India is the only nation other than the five nuclear weapons powers to operate nuclear powered submarines....
The Bulletin of Atomic Scientists January/February 1990

India has decided to cancel plans to acquire six Soviet Charlie- class nuclear powered cruise missile submarines. Radiation problem on the Charlie, nicknamed "Chernobyl-class" in India, are apparently more severe than reported in *The Bulletin* last month. According to *Navy News and Undersea Technology,* one Indian scientist may have died from radiation poisoning suffered on board the submarine. India is likely to return the two submarines already received from the Soviet Union.
The Bulletin of Atomic Scientists: March 1990

Editor's Note: Will the advocates of "openness in government" confirm these somewhat mutually contradictory reports?

Dirty Tricks of Decent Men

Nucleocrats are as a rule rather dismissive of the prospects of alternative sources of energy. As an example, this is what Dr.M.R.Srinivasan, the erstwhile nuclear czar has to say in a recent issue of Seminar (No 370):

"There is much talk of non-conventional energy sources like solar, wind, tidal and biomass. All of them have their own limitations and their contribution can at best be marginal. Electricity from photovoltaic cells is very expensive. Power from windmills is meagre and unsteady. Tidal plants are too complex. Biogas and biomass can at best make a marginal contribution. Nuclear power thus seems to be the only viable source...."

Now normally one would accord great weight to such 'technical' opinion. Indian decision makers are more prone than most to accept such statements uncritically. But should they? Are nucleocrats impartial umpires in these matters which concern their own bread and butter (and jam) so directly? Below we present a case history from Britain where the honourable gentlemen were not very honourable after all.

The scandal of the lack of support given to renewable energy research and development in the UK, can only be understood in the light of the determination of the nuclear lobby to press on with Britain's nuclear programme at any cost, in spite of considerable public opposition. If benign renewable sources could be demonstrated as viable alternatives to the four pressurized water reactors (PWRs) which the Central Electricity Generating Board (CEGB) planned to come on stream in the 1990s, then Britain's plans to expand nuclear power would collapse.

In 1976, the Department of Energy (DEN) believed that wave power was "the most attractive of the renewable sources", while wind power was seen as being much less viable. It was therefore in the interest of the nuclear industry to boost wind power as "a winner" (though not too vigorously or it might itself become the alternative to the PWR programme) and run down the prospects of wave power. This the nuclear lobby did with great success, and in 1982 wave power research and development was closed down and wind power was established as the high priority renewable.

Sabotaging Wave Power

A number of wave power devices suffered from the decision to close down wave research in 1982, but the documentation available is largely concerned with the device developed by Professor Stephen Salter at Edinburgh University and popularly known as 'Salter's Duck'. In simple terms this is a canister which bobs up and down on the waves like a floating duck, the resulting motion driving an electrical generator.

The consultants who had been appointed by the Department of Energy to help develop the various wave energy devices, reported in March 1982 that the design of the Duck was "near optimal in weight and efficiency, and ... must be assessed in terms of the probability of success or failure at the end of a significant development phase." They also believed that *"essentially the engineering stands or falls on the feasibility of achieving a very consistent maintenance free life as indicated. Experts consulted are not prepared to discount the possibility that this may be achieved if the necessary effort is made available* "(emphasis added). The consultants concluded: "Given the engineering means of realising it, the concept is hard to fault."

A unit cost of 5.5 pence per kilowatt-hour (p/kWh) was calculated for the cost of electricity from the Duck, and this was so close to the target set by the Department of Energy that for the first time it appeared that a renewable generating source might be developed to compete with nuclear power.

Although the Department of Energy is full of nuclear power protagonists, and those seconded to help the development of renewable energy sources did not always leave their nuclear commitment behind, the first engineer in charge of the Duck project, Clive Grove-Palmer, was well disposed and gave helpful criticism to the Edinborough team. He gave a paper to the June 1982 Conference on Wave Energy Utilization at Trondheim in Norway, which estimated the development potential for electricity from the Duck as 3p/kWh. This estimate, which was made well before the conference, together with the consultants' report, forced the nuclear lobby into action.

A meeting of ACORD (the Department of Energy's Advisory Council on Research and Development) was held on March 19th, 1982. In an extremely unusual move, Grove-Palmer, the programme manager, was excluded from the meeting. Instead, a secret report (published eight months later by ETSU, the Energy Technology Support Unit, which is based at Harwell, headquarters of the UK Atomic Energy Authority, and like the UKAEA is controlled by the Department of Energy) persuaded ACORD that wind power had more immediate possibilities of being economic than wave power, and that the required reduction of the renewable research budget from

£ 14m to £11 m a year would therefore have to be met by closing down wave power research.

This £3 million economy in renewable research - the ostensible reason for closing down wave research - was enforced at a time when the Department of Energy was spending £200m a year on nuclear research. Both wind and wave research could have been kept going instead of terminating the wave programme on an estimate of wind power economics which was as over-optimistic as the estimates of nuclear power have proved to be. But worse was to come. Soon after the ACORD decision to close down wave research, Clive Grove-Palmer unexpectedly took early retirement.

> [Grove-Palmer: I resigned ... Because they 1 asked me to write the obituary of wave power. There was no way I could do that - I had been involved with it much too much
> .Interviewer: And you think that obituary shouldn't be written?
> Grove-Palmer: I'm sure it shouldn't, absolutely sure It shouldn't. We were Just ready to do the final year of development
> [and then go to sea. ____________________ J

After Clive Grove-Palmer's resignation, Peter Davies was appointed to take charge of running down the research of all the groups doing wave power work. His devotion to the cause of renewable energy can be gauged from the fact that he was later chosen to present the Department of Energy's case at the Inquiry into the proposed expansion of the nuclear plant at Dounreay in Scotland.

Casting Unfair Doubts

Perhaps even more disturbing is the case of the consultants' report. The main consultants (RPT), who had little electronic experience, employed a sub-consultant, Gordon Senior, with special responsibility for Ducks. He was able to subject the team's ideas to a considerably more rigorous scrutiny than had been done before, and he sat in on meetings with potential suppliers. After many long meetings, it proved possible to hammer out almost complete agreement between Gordon Senior, the civil engineers at construction company John Laing, and the team at Edinburgh. Unfortunately for the team, many of Gordon Senior's conclusions were reversed by people in RPT who had not been present at the meetings and who had very little contact with the work.

Gordon Senior gave written evidence to the House of Lords Committee on renewable energy, in which he concluded:

"My conclusions were the last part of the report to be formally drafted although my opinions had become well known to RPT as the work had progressed. My final draft of these sections was submitted in 'lay 1983. I expected a response from RPT within days to discuss these consistent with our established practice. When this was not forthcoming I telephoned the RPT Project Manager to be told that the report had been completed, was to be submitted that night and could not be discussed. When pressed I was told that the conclusions had been altered. When I asked for a copy to examine what changes had been made I was told that no copy had been allocated to me and that copies were in short supply. When I pressed harder I was offered a copy on loan. I found that most of the text of the report was as I had drafted but the key conclusions had indeed been changed and even reversed. I objected and asked for my views to be made known to the DEN but was told that this could not be done and that I was bound by client confidentiality to RPT not to reveal my disagreement. I was also advised not to have further contact with the device team."

The next step was almost unbelievably bizarre. On the pretext of devising a system that would enable a simple comparison to be made of the capital costs of different renewable energy devices, the method of calculating the capital cost of the Duck was changed. The Duck had been costed on the basis of a detailed 140 page document, and by obtaining quotations against engineering drawings for all the bought in items. The official consultants prepared their own estimates, which were close, but a little higher. The Department of Energy's simple 'parametric' system replaced the 140 pages of detailed instructions with costings by weight, with just four different categories:

"Ballast costs- £50—£100/tonne; Concrete structures cost - £400—£600/tonne; Steel structures cost -£ 2000—£4000/tonne; Mechanical and electrical plant costs -£10,000—£20,000/tonne".

Such a system may be simple, but almost any renewable energy device comes in the last category and the costing penalize the heavier devices.

In the Duck, which has to be heavy enough to only just float, the welded steel lining of the power canister, its contents and the concrete casing, together weigh 300 tonnes. The quotation obtained for the steel lining from the Heavy Engineering Division of Whessoe Ltd was £850 per tonne for the 180 tonnes of steel. The Department of Energy insisted that it be costed at £ 10,000/tonne in calculating the cost of electricity from a Duck. Most of the machinery and electrical gear inside the power canister, and the concrete casing in particular, cost far less than £ 10,000/tonne, giving an average cost for the whole Duck of about £1000/tonne. Nevertheless, the Department of Energy insisted that the whole 300 tonnes be costed at £ 10,000/tonne. This added £2.7 million to the capital cost of each Duck, and with other lesser absurdities pushed the unit cost up to the 9.8p/kWh in 1987 prices quoted by the CEGB at the Hinkley Inquiry.

Faulty Cables

Possibly even more difficult to believe is the saga of the reliability estimate of the cables taking the Duck's electricity production to the shore collection point. If this cable has a fault, the Duck is out of action until the cable is mended or replaced. There should have been little difficulty in producing a reasonable figure from the worldwide experience with undersea electric cables. Norwegian figures showed that cable faults could be expected once in 625 years per kilometre of cable. The North of Scotland Hydro Electric Board has around 80 cables to islands off the coast, some of which date back to the 1930s without a fault; and their 43 km cable to Orkney, which suffers similar waves and much worse currents than those of the Atlantic wave fields where the Ducks would be stationed, has achieved 300 kilometre years without a fault.

The consultants' first report in November 1980 gave details of the data that had been used and estimated reliability at 333 year kilometres. This was only half the Norwegian figure, but meant that for a 10 kilometre cable a fault on average would only occur after 30 years - more than the expected lifetime of a Duck. However, in May 1982, a second report by the same consultants reduced the reliability to one fault in 100-125 year kilometres. In the summary, which was eventually accepted as a double misprint, it was given as one year per kilometre. How the estimate of the same reliability figure could have come down from 300 to 1 in official reports, without the final ludicrous figure (a 10 kilometre cable failing every month) being queried except by the Duck team, remains a mystery, since no data or references were given except in the first report. Professor Salter was prevented from discussing the problem with the consultants, who had been told not to answer his questions by a Department of Energy official.

The obstacles put in the way of the Duck and other wave research were legion. Yet another example is that according to the Department of Energy's consultants, building 1000 wave devices would, "be unlikely to show great reductions (in the capital cost of each device) from the manufacture of a single prototype", whereas, according to Department of Energy officials, building 10 of the 60 metre Orkney wind turbines would reduce the cost of each to a third of that of the prototype.

Salter concluded his original Memorandum to the House of Lords Committee thus:
"We must not waste another 15 years and dissipate the high motivation of another generation of young engineers. We must stop using grossly different assessment methods in a rat race between technologies at widely differing stages of their development. We must find a way of reporting accurate results to decision makers and have decision makers with enough technical knowledge to spot data massage if it occurs. I believe that this will be possible only if the control of renewable energy projects is completely removed from nuclear influences".

Excerpted from: *The Ecologist* May/June 1990

Nagercoil Demonstration

The somewhat dormant agitation against the proposed Russian built VVER nuclear power plant at Koodankulam has again entered an active phase following a big demonstration on 29th April 1990. The last such demonstration had taken place a year back under the auspices of "Protect Waters - Protect Life" march in May 1989. (See Anumukti Vol.2 No.6) Though there was a shooting incident during that march, there has been no enquiry into the incident as yet.

There were plans afoot to have a big rally sometime before the parliamentary elections but these had to be postponed as one of the leaders of the organising committee decided to stand as a candidate.

Though the April 29th rally was planned at short notice, it attracted a wide participation from various organisations amongst them National Fishermen Forum and Environment Protection Movement. Women's and students' groups also participated along with workers belonging to various political parties. The march started from Hindu College and proceeded through Veepamodu junction, Monymeda, Nagarajar Didal, Kothar before ending in a public meeting near the railway station. The meeting was addressed by Mr.Tom Kochery, Dr.Kumaradhas, Dr.Mrs.Indira Surendran, Dr.Valanar and Mr.Mony amongst others.

There was a time when the Kanyakumari district was famous for its green appearance and had many water springs. However over- exploitation of ground water for the production of commercial crops like rubber and deforestation have led to a deepening of the ground water level and an infertile soil. Now, the Tamil Nadu government has declared this once green district into a drought prone zone. Thus, the issue of water has assumed a central role for the people of this district. The Nagercoil township at present receives municipal drinking water supplies only once in ten days. Some areas of the township get supplies once every two weeks.

The main source of fresh water in the district is the Pecheiparai dam. Constructed by the Maharaja of Travancore during pre- independence times, its waters have been used for irrigation only. Now, it is proposed to take these waters for cooling the reactors. Thus it is no surprise that the issue of water dominated everything else at the meeting. Two resolutions were adopted:

If the work continues with the aim of taking water from the Pecheiparai dam for the reactor, then the people will remove all the stones which were marked for the plan line from the dam to the reactor.

The second step would be stopping of all payment of tax towards land and water.

Solomon Victus
37 Ponmeni Narayan St.
S.S. Colony Madurai-16

The Anumukti Cycle Yatra

All you really need is a megaphone. You halt at a street corner and start talking. People gather around, listening intently. Sometimes somebody asks a question. You explain. Some people nod in agreement others start leaving. Others in your group go around distributing leaflets describing the objectives of the yatra or with a donation box. Most people do contribute. You end with a song or two. There is an outpouring of good wishes. You climb your cycles and are back on the road again.

There were eighteen of us in all who set out on the Kakrapar to Rawatbhata cycle yatra sixteen on cycles and two on a motorcycle. Two friends had come all the way from Rajasthan just to join in the yatra. There was a local lad from Vedchhi. The rest were students and workers from the Sampoorna Kranti Vidyalaya. Together we represented Orissa, Maharashtra, Rajasthan, Bihar, and U.P., besides Gujarat.

We planned to start from Vedchhi on 9th of April in the afternoon. The days just before departure were incredibly busy. The poster exhibition needed to be completed, the leaflets had to be printed, the cycles had to he collected from friends and well wishers and made road-worthy, the April issue of Anumukti had to be printed and on and on... It seemed certain that we would never be ready on time.

But come the scheduled time, wonder of wonders, we were off. In the morning we had a meeting at which friends from the Vedchhi area had come and wished us success. But at the time we left, our only audience were three policemen who radioed our departure to their superiors. During the trip, right up to the borders of Gujarat we were accorded the honour of an escort by the guardians of the law. After all the main purpose of our yatra was to spread awareness amongst the people of the dangers posed by the nuclearisation of the country. And all governments know instinctively that public awareness is something that is detrimental to public order. Our first night halt was Bedkuadoor, a small village some five km from the Kakrapar atomic power plant. The route we had originally selected was under repairs and we had to make a detour which added 15 km to the journey. It was dark by the time we reached our destination. The police van stuck to us like a limpet. In fact its headlight illuminated our path. This close attention did achieve its objective of intimidating our hosts. No public meeting was held and even a private showing of a video film had to be cancelled .

Mandavi is a taluka town just five km from Kakrapar as the crow flies. We started after sunrise and dilly-dallied over a bath in the river Tapti. Our local hosts had arranged a meeting for us but had not been able to advertise it. Seeing our megaphone they asked us to go all over the town in a procession and invite people for the meeting. However, we found that a lot of people would just gather wondering what was being announced on the megaphone. So besides having our scheduled meeting we had six other street corner meetings. The lessons learnt that day in Mandavi were to stand us in good stead throughout the trip.

We stopped over for lunch at a girl's school at Roopan. It was examination time but yet the girls made us welcome and listened to us with great attention. On our way to Netrang in the afternoon we had a very good meeting at Zhankhwao. But Netrang was a disappointment since a visit by the local gendarmes had made our local hosts cancel our programme.

The first two days were physically the most tiring. We got up at 4.00 AM next morning and left for Rajpipla. Travelling by the light of the waning moon in the cool weather with soft breezes blowing was so enjoyable that we made it into a regular habit for the rest of the trip.

Mangrol, which was our next halt is a beautiful village on the banks of the Narmada. Swimming in the river was a special pleasure. The programme had been organised by Aradhana, an old student of the vidyalaya and lasted well into the night. The whole village came and when we left the next morning our numbers had been increased by the addition of Jyotish who accompanied us all the rest of the way.

For the next few days our route lay through the valley of the valley of the Narmada. Here the main question in people's minds was the Sardar Sarovar dam. There had been strong protest and brutal police suppression al Alirajpur just then.

Our last halt in Gujarat was at Rangpur - the village which has become famous as the origin of the Lok Adalat concept. Shri Hari Vallabh Parikh had arranged meetings for us in five different villages and accompanied to all of them despite the lateness of the hour.

We entered Madhya Pradesh the next day at Bakhatgarh and proceeded towards Attha. There was a phase transition in the condition of the roads which became incredibly bad. One began to understand the meaning of the word "doob-kshetra". The government just doesn't carry out any repairs since any way the area is to go under water after the dam starts filling up. The funny thing was that most of the road we travelled was not in the "doob".

The scenery in this part of Jhabua district is very beautiful. The mountains just roll on and on. Unfortunately, nay criminally they have been denuded of most of their forest cover. We made slow progress since punctures were plenty.

The work being done by a group of young activists Amit, Jayshree, Rahul and Narendra at Attha in extremely trying conditions is an inspiration. We had a good meeting in a house on top of a small hill and then left for Jhandana. However, we made an unscheduled stopover at Temla. (See Box)

The sun went down as we reached the banks of the river. There wasn't much water in there but plenty of sand. We got of our bikes and trudged across. A snake's carcass lay near a stone. It took us some time to decide on the path to take since there were quite a few paths emerging on the other end. All of us were tired and dusty and beginning to feel very hungry. We wished our night halt wasn't another 15 km away.

Temla is a small tribal village. Maybe, some twenty to thirty houses. There was a house by the roadside. Uma walked in while the rest of us waited outside. She asked for water to drink. An old woman came out. "How can you drink the water that has been touched by me. You better go to the Patelia's house. It is nearby," she said. "No way", Uma answered, and added "We will all drink water here."

Young men from the village gathered around. We told them that we were on a cycle yatra and about the purpose of the yatra. They invited us to stay the night with them. "Food is no problem" they told us. They were terribly poor and there were twenty of us, all hungry to the core. Yet they did not hesitate for a moment. They collected two rotis each from every household. Some Bajara, some Jowar and made us some Dal.

It was a delicious meal. After the meal the whole village gathered together. We sang songs, danced together, tapped an overhead electricity line to show them slides of Hiroshima, talked about what development means and what it ought to mean. Our tiredness disappeared in the warmth of their welcome.

Early next morning, well before dawn, we were on the road again. Meeting people, shouting slogans, distributing pamphlets, discussing issues ... but most of all pedalling on, negotiating the road and fighting the heat. Temla was etched in our hearts.

The high-point of our trip the next day was the meeting with Baba Amte. He had come to Badwani to address a meeting on the occasion of Ambedkar Jayanti. Unfortunately not all of us could meet him. We stayed the night at Chikhalda on the banks of the Narmada and had a fantastic introduction to our staple food for the next few days - Bati and Dal.

By now our daily routine was set. The aches and pains of the first few days were a distant memory. All of us had realised the pure joy of riding before dawn and thus there were no complaints at all at getting up at four in the morning. We would try to cover about 25 km in the first two hours, then have breakfast and cover another 20-25 km in the next three and a half hours with a good number of roadside meetings. By then it would be too hot to do anything but rest. If we had farther to go we would do that late in the afternoon.

From Chikhalda to Khalghat we made a lunchtime halt at Dawana. A local householder Sbri K.L.Tiwari heard that we were passing by and there was some difficulty about feeding us. At the time he and his family members were just about to sit for their own meal. But true to ancient Indian tradition regarding hospitality to guests they prepared a sumptuous meal for us first and only later took their own food.

That night at Khalghat, for the first and the last time during the whole trip we prepared our own food. We spent the night in the premises of a temple. All of us pitched in into the making of the meal and it was good fun.

The next leg of our journey, from Khalghat to Indore was the longest of the trip. A little over 100 km. Also, there were the Vindhya mountains to cross. We were all tired by the time we reached Indore but were sustained by the knowledge that the next day was to be a day of rest.

At Indore, our party was increased by two. Narayan Desai, at 66 the oldest member of the group and my daughter Dua, who at 6 was the youngest joined us for the rest of the tour though they did most of their travelling in buses. The programme at Indore was somewhat of a disappointment. The press conference got hijacked on the question of Kashmir while the public meeting had a very thin attendance. On top of this the mosquitoes were something fierce and their numbers would have done credit to a large colony of bacteria.

Eklavya, our hosts in Ujjain had organised a meeting with the bar council. The discussion became rather lively with questions on the bomb option dominating. The meeting lasted two hours beyond schedule.

On the road from Ujjain to Mahidpur, we had our first experience of an adverse wind. Our route till now had been in a north- easterly direction generally and the wine's had usually been favourable. The bath in the river Shipra after reaching Mahidpur was an extremely welcome interlude. The meeting that night in the Mahidpur bazaar was well attended and we had an enthusiastic response.

The road from Mahidpur to Jaora was a torture. The winds were strong and they were dead against us. We somehow made it to Tai for our morning halt. We wanted to have a bath in the river (Chambal) but were warned against it by the villagers who said that the water was too polluted with chemicals from the factories at Nagda and a bath was likely to cause outbreak of itching and rash all over the body. There was an unexpected surprise in store for us at Tai. Sunil, one of the organisers of the Rawatbhata convention and our contact person there came to meet us. From then on he was to be our constant companion for the rest of the trip. He had before coming personally visited a number of villages and small towns on our route and made arrangements for our stay and meetings.

During the next few days we had well attended and enthusiastic meetings in Mandsaur, Manasa and Rampura. There were extensive discussions at these meetings and at times sharp questions were asked. But the people who came had an open mind and were willing to listen to an alternative point of view. Our yatra was reported extensively in newspapers and there have been follow up reports coming in newspapers since. Thus, in the sense of a continuing public education programme, the greatest success of the cycle yatra was in these small towns near the M.P. - Rajasthan border. This encouraging response has also made us think in terms of organising a week's camp on nuclear issues sometimes in the winter in one of these places.

The last night on the road was again a very different experience. We stayed at the Gandhisagar dam as guests of the dam authorities. The contrast between this official reception and the official hounding by the police in Gujarat was an interesting example of the right hand of the government not knowing what the left was up to. We were overjoyed by the fact that 12 youths from Rawatbhata had come all the way (55 km) to welcome us and the next day they accompanied us on cycles.

The last day of the yatra was the most memorable. All during our trip - a distance of nearly 1,000 km we had not come across a dense jungle. This despite the fact that most of our route lay through lands that are officially 'forests'. Near Gandhisagar, this great lacunae was fulfilled. There were thick forests. But they were the strangest forests we had seen since in this hot season they did not contain even a hint of greenery or leaves of any other colour. We had our largest public meeting of the trip at Eklingpura - a village of persons displaced by the Gandhisagar dam. Even after the meeting, a number of women were still wanting more information and they had a separate meeting with Sanghamitra. Contrary to our regular custom we left Eklingpura early in the afternoon since we wanted to reach Rawatbhata before nightfall. The Sun bore down with merciless fury. Whatever little water we had brought along was soon consumed and the last ten kilometres were a special agony. Relief finally came at Tamlao. We had enough to drink but more than enough to think. (See Chernobhata? page 3)

Although the cycle yatra formally ended at Rawatbhata, there were further adventures in store for us on our return journey. We came by train from Kota to Baroda and then loaded the cycles on top of a bus for further journey. Near Surat we had to cross an overhead railway bridge and five cycles came crashing down. Fortunately no one was hurt, though two bikes got completely smashed.

Surendra Gadekar

Chernobyl Day at Rawatbhata

The construction of the first unit of the nuclear power plant at Rawatbhata originally started in the sixties along with dams. At the time the people of this sparsely populated corner of Chitaur district welcomed the move. They were seen as new 'temples' of development. But now the local people have started feeling the harmful effects of radiation. At the same time the government proposes to expand the number of units from two to eight and work has already begun on units 3 and 4. It was with this background in mind that the sarpanch of Rawatbhata, Shri Ratanlal Gupta and his colleagues decided to organise a convention so that people could rethink the issue and try to come to an independent judgement.

The meeting was attended amongst others by physicists, medical doctors, environmentalists, social workers, thinkers and intellectuals. There was a fair amount of local participation. A rally was taken out befre the meeting from Rawatbhata bazaar which walked 3 km before ending at Charbhuja temple.

The meeting was chaired by Shri Gyanchand Jain. It began by observing a two minute silence in memory of the Chernobyl victims.

Local residents were first invited to share their experiences. Shri Bhawani Shankar of Jharjhani said that in the last five or six years the incidence of T.B. and cancers had increased tremendously in his village. He also said that sterility had become common amongst the youth. Also there had been significantreductions in both the number of cattle and in their milk yielding capacity. Saleh bhai from Mandesra said that while the villagers had been made to share the dangers of atomic radiation equally, the power plant authorities had discriminated against them as far as benefits like health care and educational opportunities were concerned. The sarpanch of Badoli said that reports concerning the leak of H2S gas from Heavy Water plant had been suppressed by the authorities though the leak had affected both the villagers as well as security persons at the plant. The chairman of the unemployed youth association, Shri Rajoria said that the atomic power project had not benefited the local community in any way. A social worker Shri Rishilal complained that while the power plant authorities had made many promises they had not fulfilled even one of them. Even serious patients had to first deposit Rs. 2,000/- at the plant hospital before they were admitted. Many patients bad died in the process of depositing the amount.

The chairman of the C1TU affiliated Rawatbhata Atomic Workers Union, Shri J.C.Gupta demanded that an independent enquiry be made into the health effects felt by the workers as well as the local population. He said that the health records at the plant hospital should be made readily available to outside independent experts and the findings of the enquiry should be published. For how long will the government be able to fool the workers through attractive wages and allowances, he asked.

Amongst the visitors from outside who addressed the gathering were Dr.V.L.Talekar, a student of Sir C.V.Raman, the famous Gandhian thinker Narayan Desai, community health worker Dr. Sanghamitra Gadekar, Dr.Susbil Joshi of Eklavya Hoshangabad, Shri Sajjan Kumar of the World Peace and Environment Protection Organisation New Delhi and Dr.Surendra Gadekar of *Anumukti.* They discussed many different aspects of the nuclear issue in detail.

The gathering adopted three resolutions which demanded that there should be no further expansion of the nuclear project; that the project authorities should be responsible towards providing civic amenities such as roads, schools and hospitals etc to local population and information regarding radioactive discharges from the existing plants should be made available to the public.

On the next day, the 26th of April a seminar on Nuclear Power Plants and People's Health was organised. Before the seminar authorities from the plant distributed sets of papers which claimed that radioactivity releases from the plant had in no way affected the health of the local people. Later during questioning they retracted their claims and agreed that radiation in any quantity could produce harmful effects. The papers also stated that antinuclear activists were part of an international conspiracy to keep India backward. The papers did not bear the name of any person or organisation as printers and publishers.

During the seminar, the need for a detailed investigation of the health effects on humans and animals was strongly felt. At first the authorities claimed that they had carried out a baseline survey before the reactors had started, but later, on being questioned, admitted that their baseline survey had not been concerned with people's health.

Ram Pratap Gupta
Dept of Economics
Rampura College
(Translated from the Hindi original)

Review

The *Greenpeace* Book of the Nuclear Age
The Hidden History The Human Cost
John May
Victor Gollanez Ltd London 1989

"In California's Mojave desert in 1949, Major John Paul Slapp had just risked his life on an experimental rocket sled that pushed him beyond 31 Gs - 31 times the force of gravity. He survived only to discover that none of the G - measuring devices had worked. Captain Edward Aloysius Murphy Jr was called in to find out what had gone wrong. He discovered that somebody had installed each of the six G-measuring devices backwards. "If there's more than one way to do a job and one of those ways will end in disaster, than somebody will do it that way," Murphy remarked. Murphy's law was born."

This book contains lots of stories. Real life stories. They arc stranger than fiction. If a film were made on this book it would resemble one of those *Carry On ...... series*. Unfortunately these stories are not funny. They are too real and tragic. In these stories, valves never work, computer programmes giltch, barrels leak, weather conditions arc never right: the unexpected, the bizarre, the last-thtng-anyone-would-have-expected, has an annoying habit of happening. Murphy would understand.

This is a book which ought to be read and reread by every antinuclear activist. The prose is remarkably lucid and the stories just grip you due to their strong human interest. Unfortunately, its price is way beyond most Indian pockets. However, it is available in British Council libraries and those who have access to these should make full use of them. But even more compellingly this book ought to be read by young scientists working in the nuclear establishments. Only the realisation of their own and their instruments fallibility will save the rest of us.

We will carry some of these stories in future issues of *Anumukti* and also translate them into Hindi for access to a wider public.

Excerpt

This is a book about accidents and risk, about the nature of chance and the oppressive weight of secrecy, about invisibility and intrigue, about tragic events, about causes and effects, about official lies and the true human cost of atomic energy.

The world described in this book exists all around us, like an alternative reality. It is a world where human error meets sophisticated technology, where people make a sequence of logical decisions for the right reasons only to find that they have created chaos. Where there are many versions of the truth.

This book will introduce you to to the black briefcase in the red shack, take you on a helicopter ride over a burning nuclear core, into a damaged reactor in which life forms are breeding, and through a realm of black humour and mystical coincidence.

Because the effects of radiation take decades to reveal themselves, almost all the stories in this book are current, even though some of them begin in mid 1940s. In this context information develops its own half life - the amount of time it takes for the official truth to leak out of the canisters in which it is contained.

There is a new geography here, with a new set of significant points and a complex network of interconnections. Nuclear material is constantly on the move around the globe, it is stacked in caverns deep in the earth, and dumped in deep-sea trenches. Above our heads nuclear powered satellites produce high resolution images of nuclear navies.

Souvenirs of our journey round this planet might include sand alchemically transformed by the heat of a nuclear blast, a belt buckle from a drowned Soviet submariner, an irradiated restaurant table leg, a nuclear warhead dropped by accident in someone's back garden.

The route runs from Alamogordo to the Z-9 buildings at the Hanford reservation, via desert test sites on the edges of Mangolia, Pacific coral reefs, the Antartic, a Swiss cave, the Himalayas and the inner reaches of outer space.

The stories in this book bear witness to the daily risks we are running and the night time dangers inherent in the nuclear dream. They lift the shroud that cloaks an enormous industrial enterprise designed to defend rival ideologies: an atomic Papacy of Byzantine splendour and colossal scale with deep and historic institutional roots and a secretive bureaucracy.

Against this are ranged the unborn, the innocent and the unsuspecting. The widows of the ex-servicemen who happily posed for pictures in the Pacific sunshine on board irradiated battleships in 1947, and collected a cancer along with their discharge medal. The children of Kiev, who were not evacuated until after their traditional May day parade had been dusted with radiation. The Navaho shepherds, the Mexican steel workers, the Marshallesc islanders the Australian Aborigines - all have been on the receiving end of this invisible threat.

Operation Hat

If some nuclear accident stories read like scripts for Hollywood disaster movies, then the story of Operation Hat reads like a script for a spoof spy caper.

Operation Hat began shortly after China's first nuclear bomb test in 1964. The US CIA, with the cooperation of the Indian government, planned an expedition to the Himalayas to plant a nuclear powered monitoring station on the summit of the 26000-ft- high Nanda Devi, from where it would eavesdrop on the Chinese nuclear test programme in over-the-border Xinjiang Province.

The Agency recruited several top US civilian climbers who, together with four of India's best climbers from the 1962 Everest expedition, formed the cadre of the ill-fated Operation Hat. Far from succeeding in eavesdropping on the top-secret Lop Nur nuclear test site, Operation Hat was destined to threaten one of the world's great rivers with plutonium contamination.

The US climbers and their Indian colleagues set out up the south face of Nanda Devi in the autumn of 1965. A squad of porters carried the disassembled monitoring station, together with its SNAP power pack, on their backs.

the SNAP - Space Nuclear Auxiliary Power - generator was a nuclear battery originally developed for the American civil and military space programme. Shaped like a cone, SNAP was fuelled by between one to eight lb of plutonium, was small enough to be carried by one man, and would power the monitoring station till its task was completed. The CIA would then send a second expedition to recover the monitoring station, SNAP and all.

Operation Hat ran into the first of its many difficulties when the expedition encountered severe weather and rock conditions. 2,000 ft from Nanda Devi's summit, the climbers decided to turn back, but not before they had cached the monitoring station which would await their return - when the conditions improved.

The climbers ventured back up Nanda Devi in the spring of 1966, but were dumbfounded to discover that winter avalanche had swept the spy station from the mountainside. The vital SNAP generator, and its plutonium were now entombed under a mound of rock and snow the size of a Giza pyramid.

The CIA and the Indian government were in a quandry. The southern slope of Nanda Devi, where SNAP lay buried is a major source of headwater for the Ganga. A holy bathing place for pilgrims was just' a few km downstream from the SNAP site. If SNAP were to break open under the weight of the avalanche, there was a real risk that the hallowed waters of the Ganga would be polluted with deadly plutonium, and both the Agency and the government would face the wrath of millions of people.

Over the next two years, expeditions to locate and recover the SNAP returned empty-handed. Eventually, after water sampling of the Ganga revealed no contamination, the decision was made to abandon SNAP in the hope that it would remain intact and that Operation Hat would remain a secret.

The secret of the lost SNAP was kept until May 1978 when the US journalist Howard Kohn revealed the existence of Operation Hat in the Outside magazine. In a masterly worded non-statement to the Indian Parliament, Prime Minister Morarjee Desai tried to defuse the danger of SNAP: "The indirect evidence so far is that the safety precautions built into the nuclear powered power pack may be as effective as claimed and, if so, pollution effects may not take place in the future."(The Times 18.4/78)

In 1967, Operation Hat finally scored a success. A second SNAP- powered spy station was placed on, and eventually recovered from the slopes of the nearby Nanda Kot mountain.

The first SNAP is still there, entombed under thousands of tons of rubble. Many nuclear experts disagree with Morarjee Desai. They say that the SNAP generator will eventually corrode and disintegrate, releasing plutonium into the headwaters of one of the world's great rivers.

Western Middle Powers and Global-Poverty : The Determinants of the Aid Policies of Canada, Denmark,the Netherlands, Norway and Sweden
Ed. Olav Stokke
The Scandinavian Institute of African Studies, Uppsala 1990

The 20th century is coming to a close. The future perhaps lies in what Ivan Illich - a pastor, a reformist, a seeker of alternative ways says, "During the next several years I intend to work on an epilogue to the industrial age. I want to trace changes in language, myth, ritual and law which took in the current epoch of packaging and of schooling. I want to describe the fading monopoly of the industrial mode of production and vanishing of the industrially generated professions this mode of production serves. Above all I want to show that two-thirds of mankind still can avoid passing through industrial age, by choosing right now a post-industrial balance in their mode of production which the hyper industrial nations will be forced to adopt as an alternative to chaos" (*Tools for Conviviality).*

Is someone listening? Listening to the woes of the poor, to the cries of the malnourished and diseased women and children of the third world? The study gives an answer with respect to five countries viz. Canada, Denmark, Netherlands, Norway and Sweden. It analyses all the official data available.

Giving aid to a poor country is not simple. A poor country does need support, but of what kind? Will giving capital investment for industry be helpful? Would "know-how" by itself be sufficient for creating positive change? Would a project of health care and family welfare help to remove the main causes of poverty and help the people solve their own problems? Would financial support not turn them into seekers of doles and subsidies? Besides the commercial interests of the donor nations do not want to suffer. These are aspects of "aid giving".

The study documents in great detail with the help of many tables the efforts of the donor nations. All the five countries have tried to reach the goal of "One Percent" of the GNP in spite of the fact that other developed countries as a whole have lagged behind in their efforts. Norway stands out and it hascontinuously maintained a high profile aid programme.

Major aid has flowed from these countries through UN agencies, yet there has been an attempt to provide bilateral aid. There is also a recognition of the role of NGO's. But this study does not provide any details on receiving countries except their geographical locations. The impact of the aid and its implications to both parties do not fall in the perview of this analysis. This reduces its usefulness. It does give an insight into how donor countries behave and why they behave that way but it is not bothered about what happens to the receivers of the aid. It is centered on the interests of the five countries, in international affairs, aid policies, and commerce and their altruistic ideals.

The introduction of new environmental and consumer standards in the EEC, the report predicts, will increase environment pollution in the Third World. For example, EEC manufacturers unable to meet the high environmental standards at home after 1992 will transfer the "dirty" stages of their production to developing countries where regulations are lax or non-existent...

The report regrets there has not been sufficient research to estimate overall trade costs and benefits to particular countries. The community needs to take positive steps in the key area of trade, debt and aid to assist poor countries to adjust to and benefit from single market."

Excerpt

"While the future may contain unforeseen changes in the domestic and external environments, one observation about past performance is of particular importance: the aid policies of the five countries have shown a high degree of continuity and a low degree of change, despite the substantial changes which have taken place both in the domestic environment of the five donor countries and in the international environment, particularly in the Third World. The continuity of the main patterns of their aid policies covers a relatively long period of time 15-20 years. This implies that few dramatic changes may be expected in the basic patterns of their aid policies." (page3/3)

"The main determinant as far as the large multilateral aid components are concerned, has been the systematic policy interest of middle powers in peace and stability and in a global system for the maintenance of these international common good concerns. The five countries have considered a large multilateral development assistance component an instrument to this end." (page 3/4) This augers well for the future. Effectiveness of multilateral agencies to the avowed aims will determine the aid programme.

"If the main trend so far continues, it is likely that in the future, foreign aid will be even more strongly directed towards the international common good than in the past. Although social and economic development will remain the core objective, foreign aid is likely to increasingly used as a tool to attack more immediate threats to mankind, where the connection between objectives and means would appear immediate and direct." (page 3/7) And three possible threats are considered.

- The threat to the future of our planet earth and to our common destiny, caused by the pollution of the biosphere and environmental degradation.

- The threat to health.

- Crisis Management - debt crisis - threat to international economic system and the private sector (the banking system) of some major powers in the North.

Jyotibhai Desai Vedchhi

The Glow on the Greens

We golfers have had a tough time of it lately. Golf courses not only take up a lot of land, but they have begun to be identified as major polluters because of the lun-off of pesticides and fertilizers used to keep those greens and fairways the way we like them. In some low-industry areas (and when was the last time you saw a golf course next to a steel plant?) a golf course may actually be a region's largest polluter.

But Atomic Energy of Canada (AECL) has really gone too far. AECL is attempting to develop the world's first irradiated golf ball. Seriously. AECL scientists apparently figured out that irradiating a golf ball can change the molecular structure of the ball's core, producing larger molecules that may result in an 8% increase in the liveliness of the balls.

Not only we do believe this is an appaling perversion of nuclear technology, and results in the most frivolous production of radioactive waste we can imagine, it is also entirely illegal. The U.S. Golfing Association will simply never permit it. After all, some organizations still do have standards - even if the ball does glow in the dark.
(The Nuclear Monitor, May 7,1990*)*

LETTER BOX

A Message of Solidarity from Japan

We sincerely congratulate you on the anti-nuclear convention you are having on 25th and 26th of April. We express our whole- hearted solidarity. Since it has been quite difficult to know about the nuclear situation in your country, it was especially delightful to hear about the growing antinuclear movement in your country. Japan is one country which is still going ahead with its nuclear expansion programme, even after the Chernobyl accident. Despite the growing concerns about safety and the effects on human beings and the environment, Japan is still continuing with its nuclear fuel cycle plan, which envisages the production of the most deadly substance - plutonium. This is bad news not only for Japan but for the whole world. It is of special concern to our neighbours in Asia since the Japanese industry may be planning to expand in whole of Asia. However, we are happy to say that due to the widespread antinuclear movements throughout the country after the Chernobyl disaster, nowadays more people are aware of the dangers of nuclear plants. We have succeeded in electing three antinuclear Diet members from Aomori Prefecture where the nuclear fuel cycle facility is planned and also the Mayor of the site has declared a freeze on this plan. We have collected more than 2.5 million signatures asking for a nuclear phase out law, which will be submitted to the Diet on the 27th of April, the first day of the three day rally commemorating the 4th anniversary of Chernobyl disaster. We are also holding a big nation-wide festival on these three days including a symposium, peaceful demonstrations and an antinuke concert, with guest speakers from USSR, Germany and Korea. Let us join hands across the world to stop all nuclear related facilities. Let us join hands so that we can exchange information to halt all nuclear industry's movements before they actually occur. Let us join hands so that we can create a peaceful and happy environment for our children.

From all the participants
4th Commemoration of the Chernobyl Disaster
No Nukes One Earth Festival
Tokyo,Japan
28th and 29th April 1990

Recently we received a copy of a letter written to the Nuclear Power Corporation of India by Sigma Equipments - makers of a wide range of ovens and furnaces. We are reproducing it in the full since we hope it is the forerunner of many such letters by other public spirited entreprenuers and industrialists.

Sigma Equipments
886/2 GIDC Makarpura
Baroda 390010

11th April 1990

M/s. Nuclear Power Corporation of India Ltd
. P.O. Anumala
Via Vyara 394651

We have received your tender enquiry (No:CMM/KAPP/4920 Due on 30.4.1990). We manufacture a wide range of ovens and furnaces. But as a matter of principle we do not deal with organisations concerned with atomic energy generation. Our stand is based on the following facts:

- Nuclear energy is the source of one of the most dangerous kinds of pollution. Radiation at any level is harmful to life and the environment.
- As radiation cannot be measured by ordinary means nor can be sensed by the people, atomic energy experts have succeeded in keeping the population in the dark.
- The harm that the radiation can cause may not be felt in the near future but can be passed on to the coming generations in the form of damaged genes.
- This subtle violence against life and nature is irreversible.
- There is no method yet devised to safely decommission a reactor after its short life of 25 years or so is over. This is a totally unjustifiable liability we thrust upon generations to come.
- For perpetuation of the evil of nuclear energy its various agencies are controlled by the power of the state. In countries where people could have a say, the dream of nuclear energy has evaporated.
- There is always the possibility of a major accident like that of Chernobyl as even for the most perfect machinery the human factor cannot be wholly eliminated.
- Nuclear power generation is a big drag on the progress of a poor country like India. With the same amount as sunk in this large scale ego trip, a lot more power can be generated in a decentralised and safer way.
- The cover-up provided by the government to the nuclear energy establishment in the form of the Atomic Energy Act is contrary to the spirit of democracy.
- The nuclear establishment has kept alive the option of a nuclear bomb which is madness of the highest level.

In view of the above considerations we have no option but to blacklist your organisation.

Kersi Sabawala Baroda

Along with this letter I am sending some cuttings. They are from the newspaper of the IEEE (The Institute of Electrical and Electronics Engineers) called 'The Institute'. I collected these cuttings due to my interest in nuclear issues as an electrical engineer looking into alternate energy research. As these articles are written extremely equivocally someone who can read between the lines on such issues needs to go through them. That is why I am sending them to you: maybe you can find something about the trends and attitudes regarding nuclear issues in the U.S.A. and use the material *in Anumukti.* I have been reading *Anumukti* for the past year or so. *Anumukti* is doing very valuable work. Its only limitation is a low circulation - can you send in some of your material to more widely read newspapers and magazines to educate a wider public about your stand?

Johara Shahbuddin,
14 Janpath,
New Delhi 110001

I am a member of the research team at the Centre for Industrial Safety and Environmental Concerns and 1 have been working in the field of high natural background radiation. This letter is to inform you that a group has been formed called "Women Against Nuclear Energy" (WANE).

We feel that till now other women's groups in Kerala have not considered nuclear issues seriously. Thus although we are concerned with other environmental and women's issues as well, we feel that prime importance needs to be given to nuclear issues. The present situation in Kerala is bad enough; we are having the country's first commercial food irradiation plant; a nuclear power plant is in the works; and there is very high natural background radiation in the coastal regions of Kollam.

At present we have six active members. Membership is not restricted to Kerala women only. In the future we plan to have a national network. We would love to hear from other groups and individuals interested in this idea. We are also planning to have a documentation system and exchange materials with others in this field.

All India Women's Conference is scheduled in December 1990 in Kerala and one of the themes of this conference is "Nuclear Energy and Women".

Ms.Nandini K Nair
WANE, X-526, Koyickal House,
Kottayam 2 Kerala

On 26th April, we had organised a seminar here at Calcutta. Physicist, Dr.A.L.Mukherjee presided over the meeting. Among other noted speakers were Prof Sushil Mukherjee — ex VC Calcutta University, Playwrite Badal Sirkar and Prof Sujay Basu. On that day our new journal *Safe Energy and Environment* was released.

Dipankar De 28, A.V.L. Street, Calcutta

Native peoples tell us that uranium should stay in the ground - but their voices are lost in the wind. Tribal peoples possess the knowledge of the past that could help heal and restore the earth - but their views are in conflict with the nuclearized, neo- colonial mindset of the multinational energy corporations. It is time we listened to the native peoples of the earth. Before corporate wealth capitalizing on our ignorance, wipes out their cultures. Their wisdom may hold our last chance.

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Editor: Surendra Gadekar

Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi. Dist.Surat, 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat Printery, Ahmedabad.

Printed Matter Book Post

ANUMUKTI

A Journal Devoted To Non-nuclear India

Volume 4 Number 1 August/September 1990

Nucleocrats are a hard lot to please. First, they say, the nuclear issue is too complicated for the comprehension of the general mass of the people — the nominal masters in this "world's largest democracy". In fact, their claim is that the subject is too difficult for anyone, howsoever intelligent, who is not a "trained nuclear scientist," to understand. The only exceptions to this universal rule of general ignorance, are their political masters in the act of sanctioning vast hordes of money - larger than any king's ransom - required for the continuation of nuclear activities. Of course, these worthies only begin to understand nuclear complexities the very moment they enter the government and singularly fail to do so while in the opposition: but that is another story. The fact remains according to nucleocrats' often stated view: nuclear power is a subject meant only for experts and only they should be allowed to express any opinions on it.

Well, here we have a professor of engineering, (see box) a person who has, moreover, specialized in nuclear engineering from IIT Kanpur (no less!), who says that nuclear energy is irrelevant in the Indian context. It cannot meet the real energy needs of the people. The country ought to develop non-conventional alternative sources of energy and not waste time and resources running after the nuclear mirage. There is nothing very radical or 'subversive' in this opinion. Innumerable people all over the world have, of late, been saying similar things. It is, but for nuclear and bureaucratic circles, almost the accepted paradigm. The only mild surprise is that it is an 'expert' who is saying it. But then experts are people tool And people with courage of their convictions, though rare are not yet extinct.

Now one would naturally expect that the nuclear establishment would welcome this rare chance of being able to debate with someone knowledgeable rather than with ignoramuses like the rest of us. Moreover, this is in the context of setting up of a nuclear power station in Kerala — and it could be an excellent opportunity for a "learned" debate for educating public opinion. So, what does the nuclear establishment do. It acts true to form: like a terrorist it strikes at the person rather than the idea.

Once, during my earlier incarnation as a physicist, I was attending a seminar organised by the Department of Atomic Energy. One of their big-shots was giving a talk. He made, what I felt was an erroneous statement (in straight words his physics was wrong). I questioned him about it. As soon as the talk ended, he started making enquiries (from others) regarding where and with whom did I work. I enlightened him on these points myself. Later on, others from the 'department' came and said to me: "Why did you do that? He was obviously displeased by your questioning. He is a powerful person and he will try to harm your career." It was at that moment, that I decided that an establishment which consisted of such petty, vindictive and moreover ignorant characters needed to be exposed through full-time active opposition.

For the safe operation of nuclear installations in the country, even for its safe dismantling, it is absolutely necessary that persons manning the nuclear installations do not have the "nuclear mindset". The commission which investigated the Three Mile Island disaster of 1979 made the following observation:

"To prevent nuclear accidents as serious as Three Mile Island, fundamental changes will be necessary in the organization, procedures, practices and above all in the attitudes of the nuclear industry. The belief that nuclear power plants are sufficiently safe has grown into a conviction. One mus: recognize this to understand why many key steps that could have prevented the accident were not taken. The Commission is convinced that this attitude must be changed to one that says nuclear power is by its very nature potentially dangerous, and, therefore one must continually question whether the safeguards already in place are sufficient to prevent major accidents."

Therefore, the need for independent critical expertise is fairly obvious. People who could and would question ideas, designs, operational procedures and sometimes maybe even the relevance of the nuclear enterprise. An organisation interested in the proper running of its plants would try to promote the emergence of such expertise within the system. But, instead what we have in India is an establishment organised somewhat like the army. Obedience to 'superiors' is the keyword. All recruitment of officers is done through the BARC training school. The trainees know that those who are their seniors shall remain their superiors all throughout their careers since the only avenue open for employment are the various establishments run by the DAE.

Not satisfied with keeping its own 'soldiers' well in line, the nuclear establishment tries its utmost to ruthlessly stamp out dissent anywhere in the scientific community. The action against Prof. Menon is not an isolated instance. DAE has systematically tried to undermine the credibility of the only nuclear engineering programme (at NT Kanpur) outside its own control. Of the 47 M.Tech. graduates till 1987, only one had been absorbed by any DAE run unit.

It is a great pity that nucleocrats have to a large extent succeeded in their design of keeping the Indian scientific community in a state of docility. It is in vain that one looks for any sign of outrage or protest from scientific bodies like the academies at DAE's arbitrary high-handedness.

It is not only the right but in fact the duty of the scientists to inform and educate the public on life and death issues raised by the application of science for the 'service of man'. No bureaucrat should ever be allowed to use the pretext of 'service rules' to bludgeon an independent minded scientist into silence. Freedom needs zealous guarding.

Surendra Gadekar

Scientist Sacked for Criticising Nuclear Plants

Prof.R.V.G.Menon has been relieved of his charge as director of the Agency for Non-conventional Energy and Rural Technology, for 'embarrassing' the Government by openly airing his views against nuclear power plants in the State.

He had published his opinion in a local Malyalam daily and magazine as a sort of rejoinder to Atomic Energy Commission chairman Dr.P.K. Iyengar's statement at a news conference in Tiruvanthapuram early this year. The Government sought Mr.Menon's explanation for violating the Government servants conduct rules and going to the press without getting its prior sanction. The Government order said that Mr.Menon's statements have landed it in an embarrassing situation.

Mr.Menon, who had been given a two year extension at the end of the first term in March this year, has been reverted as professor in the mechanical engineering department of the College of Engineering, Thiruvanthapuram.

When contacted, Mr.Menon said: "I still feel what I have done is correct. I will continue to express my opinions fearlessly in the future also". He said that it was out of conviction and experience after obtaining an M.Tech. in nuclear engineering from I.I.T. Kanpur, that he had been advocating the cause of non- conventional energy in the past 20 years.

He could not fail in his basic duty towards the public, who will be the ultimate victims or beneficiaries of nuclear energy. AEC chairman, Dr P. K. Iyengar, during his press conference had asked people like Justice V.R.Krishna Iyer not to sit In judgement on a subject that should be decided by scientists and experts. Dr Iyengar had also predicted that the proposed thermal plant at Kayamkulam would be more dangerous than a nuclear installation. It was in these circumstances, especially when a public debate was on, that he wanted to present the other viewpoint, Mr.Menon said. Referring to the Governments action, Mr Menon said his understanding of the rules was that Government servants can express their opinions in public on issues of a purely literary and scientific nature. "And I have not overstepped that limit", he said.

Indian Express August 1, 1990

Economic Miracle: Ecologic Disaster

By conventional economic measures, Taiwan's success is undeniable: at $7,000, Taiwan's per capita income has overtaken that of some members of the European Community. The economic growth rate has averaged close to 9% per year over the last 30 years, outpacing everything but the speed of environmental destruction. Today, most Taiwanese are wondering if material benefits of high speed growth are not, in fact, outweighed by its costs. The people are increasingly refusing to tolerate two of the basic ingredients in the recipe for high speed growth: low wages and environmental degradation. There has been a rapid increase in labour disputes during the last three years and the influence of neighbourhood environmental activists has been on the ascendent among all sectors of the Taiwanese society and now poses a potent challenge to the technocrats' ideology of the primacy of growth.

Taiwan's landscape is as enchantingly green now as it appeared to the Portuguese seamen who christened it Formosa', or "Beautiful Island". But beneath the greenery is poisoned soil. Besides the greenery flows polluted water. And, increasingly, the green itself is toxic grain.

Undoubtedly the greatest potential threat to the environment in Taiwan is nuclear power. Taiwan now has three nuclear plants; if the technocrats had had their way, the island would have been inflicted with a plan to build 20 by the year 2000. Rising public opposition, however, has stymied government plans to build a fourth plant, and the growing space for democratic discussion has pushed the public into taking a more critical view of the whole nuclear power programme.

The nuclear power programme may not serve the interests of the Taiwanese people, but it does serve several powerful domestic and foreign interests:

The Foreign Vendors

Taiwan proved to be a lifesaver for a US nuclear industry that was threatened with extinction as a result of the loss of its domestic market in the late 1970s and 1980s. With tight repression by the KMT(Kuomintang) government curbing antinuclear sentiment, the nuclear monopolies were able to carve up the Taiwanese energy market. This 'gentlemen's agreement' is clear from the pattern of contracts: General EIectric supplied the reactors for plants Nos. 1 and 2—the Shihmin Hsiang and Kuosheng sites outside Taipei—and generators **for** plant No.3 at Maanshan. Competitor Westinghouse, meanwhile, provided the reactor for plant No.3 and the generators for Nos.1 and 2. San Fransisco based Betchel corporation provided the architectural and engineering services for plants Nos.2 and 3.

The KMT-Business Elite

Realpolitik entered Taiwan's nuclear equation in the fallout of the US decision to cut off diplomatic relations with Taiwan and recognize the People's Republic of China. Seeking to replace severed diplomatic ties with tighter economic ones, the KMT- business elite saw nuclear energy development as a way to induce prestigious US corporations to increase their economic interests in Taiwan. With the nuclear vendors and other US firms securely anchored on the island, the KMT correctly reasoned, the US government would hesitate to cut off all military and political ties.

The Technocrats

Nuclear power plants provide an opportunity for centralized bureaucratic control unmatched by any other energy technology: already, just three nuclear plants supply over 53% of the electricity generated on the island. Thus Taiwan's technocrats are a natural constituency for nuclear power. Centralization of Taiwan's energy supply is conducive to the technocrats' visions of state-guided high-speed growth. And centralized power production concentrates more economic and political power in their hands.

The Military

The opportunity to reprocess spent fuel from reactors to make weapons grade plutonium has made Taiwan's military a natural ally of the nuclear energy programme. The military's active persuit of the nuclear weapons option is one of the more dangerous elements of the hostility between the KMT government and the communist government on the mainland. Two controversial incidents have highlighted the link between the 'peaceful' nuclear power programme and nuclear weapons. The most recent was the defection to the United States in 1988 of a Taiwanese colonel, Chang Hsien- Yi who served as a deputy director of the Nuclear Energy Research Institute (NERI) of the Chungshan Institute of Science & Technology, the top military research centre and part of the Defense Ministry. Identified as a CIA informant, Chang is said to have divulged information that led to US pressure to demand the demolition of a secret nuclear research facility in 1987. A similar incident occurred ten years earlier, when

NERI was forced to destroy its nuclear-waste programme after a researcher provided documents to the US.

Towards a Taiwanese Chernobyl?

Safety issues are a special concern to Taiwan which is one of the most densely populated countries in the world. Taiwanese nuclear power experts argue that the greatest threat to nuclear safety in Taiwan is not human error — the cause of both Three Mile Island and Chernobyl disasters — but external events such as earthquakes and typhoons. Even if one were to accept this assessment at face value, there are strong grounds for questioning the soundness of the nuclear energy programme, since Taiwan is regularly battered by typhoons and lies along the so-called 'Pacific Fire Belt', a ring of intense tectonic and volcanic activity. Indeed, the Shihmin Hsiang and Kuosheng power plants, just 12 miles from Taipei, are said to be situated at the edge of the active Ta-Tun volcano group and amid a maze of earthquake fault lines.

But typhoons and earthquakes are not the only problems. The arrogant insistence by Taipower, the state energy monopoly, that no problems ever have or ever will exist at any of its plants, contrasts sharply with widely published accounts of radiation leakages, accidents and cover-ups. In July 1985, a fire at nuclear power plant No.3 forced the suspension of operations for 15 months and caused damages valued at $300 million. So alarmed were the local residents that they organized meetings and rallies to demand safer emergency and evacuation plans and compensation for the surrounding communities. Another fire broke out at the same plant in August 1987. According to one report, Taipower tried to cover-up a major radiation leak at plant No.1 in January 1986, apparently the second accident at the plant within a year. J.Sprague in the July 1988 issue of *Bang* caustically noted:

> *"Over 1985 and 1986, Taipower's No.1 nuclear plant set a world record for continuous operation, 418 days without a shutdown ...In March 1988, local newspapers accused plant No. 1 of having set up another world record, 56 days of continuous radiation leakage outside the plant — from September 3 to October 28, 1985. Taipower denied the charge but Taipower's credibility is at a low ebb right now."*

In February 1988, a generator at the No.1 plant shut down automatically for unknown reasons, later discovered to be computer error. Two fuel pellets were stolen from No.3 plant, then found a few days later. Plant repair logs are sometimes incomplete or missing altogether. Perhaps not unrelated t othese mishaps is the inadequate training of plant personnel. While many of the best trained nuclear operators are creamed off by US firms and transferred to the US, 40% of the skilled workers in Taipower's nuclear plants are underqualified for the tasks they perform. Most reports of plant safety violations are reported by nuclear plant workers who are upset by their dangerous working conditions. In May 1988, 200 maintenance workers at plant No.1 walked through a puddle of radioactive water the plant manager knew was there. One Taipower engineer filed a lawsuit charging that the exposure to radiation made him ill, but lost the case because pertinent records were found to be missing.

Mismanaging Waste Disposal

There is a surreal quality to Taipower's record and plans in the area of radioactive waste disposal. Children in Taoyuan, near Taipei, had been playing for weeks on a pile of scrap metal near their elementary school before it was discovered to be radioactive. Old parts of nuclear plants exposed to intense radiation were said to have been sold as scrap metal, then recycled into metal for new buildings. An underground low level depository which Taipower built on Lan Yu (Orchid Island), 40 miles from Taiwan's southeast tip, lies on an earthquake fault line. Despite protests by the Yami aborigines who inhabit Lan Yu, Taipower plans to build a second low-level waste dump on the lush nine square mile island — plus a 247 acre park above the dump, including a hall with exhibits extolling the virtues of nuclear energy.

Spent fuel is currently stored at reactor sites. But this is only temporary: a location must be found which can hold the material for the hundreds of thousands of years that they are radioactive. No viable solution, except perhaps shipping the waste out of Taiwan, may ever be found.

> *"Taiwan is an extremely densely populated island. It is virtually impossible to find a site which would be remote enough that a long-lived radionuclide can be isolated from the human environment. In addition, because Taiwan is a small island, marine life is a vital component of food. Therefore, the ocean surrounding Taiwan and all the near-by small islands are virtually an integral part of the human environment. In other words, small islands outside of Taiwan, no matter how small their present population, cannot be considered 'remote'... Due to its extremely active tectonics, Taiwan has a very complex geology. It is difficult to find a basaltic or shale formation that is continuous, homogeneous stable and big enough to accommodate high level wastes. Last, but not least, Taiwan's subtropical weather conditions call for special attention on studying hydrological (both surface and underground) problems."*

The Growth of the Environmental Movement

Taiwan's technocrats' stubborn efforts to ram through the building of more nuclear power plants despite Three Mile Island and Chernobyl has spawned a strong antinuclear movement. A key event was a well-publicized seminar sponsored by the Consumers' Foundation in April 1985, which brought together a number of scholars and intellectuals opposed to the building of the fourth nuclear power plant. The fledgeling antinuclear sentiment sparked by this meeting was boosted shortly thereafter by the July 1985 tire at plant No.3 and the Chernobyl disaster in April 1986. The grassroots antinuclear movement has evolved along the decentralized pattern obtaining elsewhere. This network of 'antinuclear self-help associations' has so far successfully stymied the construction of plant No.4, leading a frustrated Taipower to hire the British public relations firm Ogilvy and Mather to promote nuclear power to an increasingly sceptical public.

The antinuclear movement, however, is just one prong of a broader environmental movement. Aside from forcing the suspension of the fourth nuclear power plant, this decentralized but increasingly powerful movement has stopped Dupont Corporation constructing a $160 million titanium oxide plant and forced the closure of a major petrochemical plant owned by the British transnational ICI which fishermen had accused of dumping acid waste in their fishing grounds. Averaging one anti-pollution demonstration a day during 1987-88, the movement represents the rejection on part of increasing number of Taiwanese of the KMT's reckless persuit of growth.

Through its militant mass actions, the environmental movement is bringing home the message that a radical transformation of Taiwan's priorities is in order. Such token measures as the establishment of a 900-person Environmental Protection Agency are no longer sufficient, say the critics. The growth rate must be radically lowered. The controversial *Taiwan 2000* report asserts that even if the annual rate of Taiwan's GNP growth were cut to 6.5 per cent, the stress on Taiwan's already fragile ecosystem would double by the year 2000.

Will this perilous prospect prove ultimately persuasive to KMT technocrats? Some Taiwanese environmentalists are sceptical, for they feel that there is more to the conflict than the clash of contrasting visions of Taiwan's future between the largely Taiwanese environmentalists and the Mainlander dominated KMT elite. According to Hsu Shen-Shu, founder of the New Housewives Association, which has forged links between the emerging feminist and environmental movements:

> *"Current policy makers do not love this place as their home since they still operate under the myth of returning to the Mainland and have not changed their basic opinion of Taiwan as a temporary stop, a hotel of sorts. After benefitting from the exploitation of the island, they send their children to the States because it is too polluted here in Taiwan."*

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The feelings expressed by Hsu are widespread, and they indicate that the day may not be far off when the KMT, with its policy of export-oriented growth at any cost, is finally evicted by the people of Taiwan.

Walden Bello and Stephanie Rosenfeld

This article is taken from the authors' *Dragons in Distress: Crisis and Conflict in Asia's Miracle Economies.* We have excerpted this bit from *The Ecologist* Vol.20 No.4, July/August 1990

Glasnost Mark n at Tarapur

The Bombay Sarvodaya Mandal along with 12 other organisations had organised a protest rally at Tarapur and Boisar on 6th of August, 1990. About 150 people participated in the rally. Of these around 50, mainly young men and women, had come from Bombay while others were representatives of local activist organisations and trade unions. Four of us had journeyed from Vedchhi as representatives of Sampoorna Kranti Vidyalaya and *Anumukti*

I was part of a delegation from amongst the protesters who went to give a memorandum to senior nuclear plant officials. The memorandum addressed itself to four main themes:

- The absence of any coherence in the nuclear power generation policy. Earlier, DAE used to shout the virtues of self reliance, but nowadays it is busy signing deals for the import of outmoded foreign technology.
- Environmental radiological pollution.
- Misdirection of scarce resources better spent on development of alternative energy sources
- The veil of secrecy surrounding atomic energy activities.

The memorandum demanded from the Government that:

- They appoint an independent commission to investigate radiological pollution around nuclear power plants and conduct a health audit of the surrounding villages.
- Section 18,19 and 20 of the Atomic Energy Act of 1962 be amended forthwith.
- A moratorium be declared on further plant construction.

On our way to the administrative building, we saw a group of employees sitting outside. We wanted to give them some antinuclear literature but were prevented from doing so. When I protested, I was told it was for 'security reasons' and due to the need to maintain discipline. "You see, we do not allow anybody to distribute any pamphlets inside the plant. That will just encourage unionism."

We were led into an air-conditioned conference room. There were more than ten people already seated at the back of the room. We were met by three plant officials. Our names were noted down. On my asking them for their names, only these three introduced themselves. "What about the others?" "Oh, they are just security men", was the answer. I wondered if the security men were there to secure the officials from us or from themselves, but I did not say this aloud.

Shri Kumar Prashant on our behalf said that we had not come to indulge in a debate on the merits or otherwise of nuclear energy with them. We deplored the secrecy surrounding the nuclear activities in the country and merely desired to exercise our right to information regarding them. The reply to this was that they were indeed a very open organisation. There was no question of secrecy at all. As proof of this bizarre statement, they pointed to the fact that they had allowed us in and had indeed made all the arrangements (including refreshments!) to welcome us.

Thanking them for their generous hospitality, I asked for a copy of the latest performance report.
"Performance report! What is that?"
"You know as well as I do what a performance report means! The document which contains reports on performance since the start of commercial operation, a detailed analysis of shutdowns and accidents, radiation levels and activity discharges, financial performance, etc."
"No, I cannot give you that since that is a policy matter."

"Could you show me the health records of your regular employees and their families?"
"No, I cannot give you that since that is a policy matter."

"What about the health records of the daily wage earners and their families who were made to do 'dirty' jobs involving high doses of radiation and then discharged after getting 'burnt- out."
"We don't keep records of the health of workers after they leave our employment. So, the question of our keeping health records of their families just doesn't arise."

"Have you conducted health surveys of the people living in the vicinity of the plant?"
"No health surveys have been carried out. Anyway, it is none of our business or concern."

"You can at least give us a copy of the emergency preparedness plan. It after all affects the public in the most vital and direct way."
"No, that is the DM's duty. We have conducted three day camps for training civil servants and taught them the procedure to be followed in an emergency. We have also printed copies of the emergency preparedness plan. But I cannot give you a copy since that is a policy matter."

So their much vaunted openness extended only up to tea and refreshments. But we could not partake of those since that was a policy matter with us.

On our return to Boisar — the railhead near Tarapur — we found that all our colleagues had been arrested for defying prohibitory orders but they were conducting a very lively public meeting from the compound of the police station and about two to three hundred people were listening to the speeches standing outside the boundary of the station.

Sanghamitra Desai Gadekar
Sampoorna Kranti Vidyalaya, Vedchhi

Hiroshima Day at Udaipur

Gandhi Peace Foundation had organised a function in the Seva Mandir compound to mark Hiroshima day on 6th of August, 1990. There was a small gathering of intellectuals who discussed both nuclear weapons and the nuclear energy issues. Many speakers emphasised the fact that both these issues were in fact only a single issue, since the 'peaceful atom could not be separated from the 'military atom'. The highlight of the day was a slide-show where both slides of people from Hiroshima as well as those of people living near the Rajasthan Atomic Power Plant at Rawatbhata were shown. There was a very lively discussion on the need for nuclear power in India.

Skeletons from Soviet Nuclear Cupboard

According to Russian nuclear engineer, Grigori Medvedev, the catastrophe at Chernobyl-4 in April 1986 had been preceded by more than ten serious accidents at other nuclear plants in the USSR, but information about them was hidden from all but very senior energy sector officials. In an article published in the US weekly *Nucleonics Week*, Medvedev suggests that this refusal to acknowledge major problems with Russian built reactors resulted in a belief on part of the Chernobyl-4 operators that a serious accident at their unit was simply not possible. In fact senior plant officials present at the control room on the night of 26th April stubbornly refused to believe that the reactor had exploded and sent operating staff repeatedly to inspect the ravaged core, thus condemning them to horrible suffering and death.

Further, says Medvedev, there were no dosimeters available that night to measure radiation levels above 1,000 millieroentgens (1 rad), leading plant officials to assure Moscow there was no radiological danger at Chernobyl, despite obvious radiation poisoning of operating staff returning from the central part of the plant. Medvedev reveals this in a new book about Chernobyl entitled *"The Chernobyl Chronicle"*, published by the Soviet writers' journal *"Noviy Mir"*, last year. An English translation entitled *"The Chernobyl Notebook,"* will soon be available from Basic Books in New York.

Medvedev worked for seven years at Chernobyl (on construction of unit 5) in the 1970s after having been transfered from the operational sector because of radiation exposure of 180 rad. Most recently, he was deputy in the central office for nuclear plant construction in the Ministry of Energy and Electrification which oversaw nuclear plant construction and operation before the Chernobyl accident. His book also contains a section about Hospital No. 6, the radiation illness facility in Moscow where he himself was treated following his exposure and where initially the survivors of Chernobyl were taken to for treatment.

Following is a list of 11 of the nuclear accidents Medvedev refers to, as published by *"Nucleonics Week* (31 May 1990):

September 1957. The now well known explosion of a liquid high level waste tank at Kyshtym defense reprocessing complex near Chelyabinsk. (See *Anumukti* Vol 2 Number 5) Large areas of land still remain off limits after decades.

May 7. 1966. Power excursion in the 62 MW prototype Boiling Water reactor at Melekess. A health physicist and a shift supervisor are irradiated. The chain reaction stops when two sacks of boric acid are thrown on the reactor.

1964—1979. Frequent destruction of fuel assemblies at Beloyarsk-1. Operating staff are irradiated during repairs to the core.

January 7. 1974. Explosion of a reinforced concrete tank containing radioactive gasses at Leningrad-1.

Febrauary 6 1974, Explosion of the tertiary circuit at Leningrad-1 from hydraulic shocks induced by violent boiling. Three persons died and highly radioactive water containing filter wastes was released into the atmosphere.

October 1975. Local core-mett at Leningrad-1. A day later over 1.5 million curies are released through the stack.

1977. Half of the fuel assemblies melt at Beloyarsk-2. Irradiation of staff during repairs which last over a year.

December 31SL..13I& Fire at Beloyarsk-2 caused by the collapse of the turbine building roof. The control cable is completely burned and the reactor goes out of control. Eight people are irradiated while trying to inject coolant into the reactor.

September 1982. Partial core-melt at Chernobyl-1 following an incorrect action by operating staff. Release of radioactive material into the industrial zone and the city of Pripyat; irradiation of staff involved in repairing the core.

October 1982 Explosion of the generator of Armenia-1 (VVER- 440), setting fire to the turbine building. The operating staff manages to keep the coolant flowing, and a team from the far-away sister plant at Kola arrives by airplane to help the Armenia operators save the core.

June 27. 1985. Accident at Balakovo-1 (VVER-1000) during initial start-up, when the pressurizer relief valve opens suddenly and steam at 300'C is sprayed into staff work areas. Fourteen people die. The accident is laid to errors on the part of inexperienced, nervous operating staff.

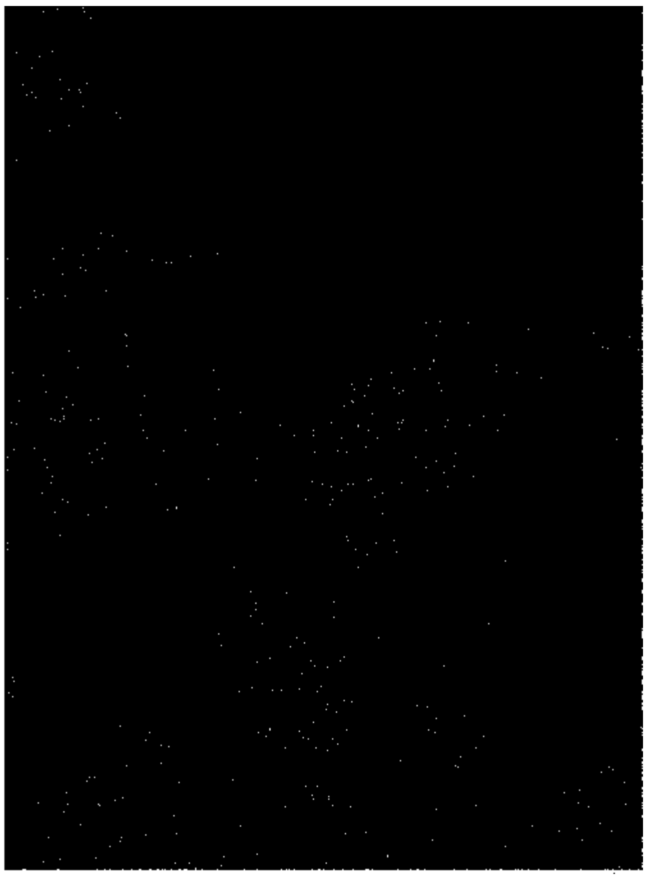
Source:
WISE New's Communique 334, 22 June 1990

Independent Verification

In our last issue we carried a report entitled "Chernobhata?" by Sanghamitra Desai Gadekar which claimed that people near the Rawatbhata atomic power station were seriously and abnormally ill and asked that a scientific investigation be immediately undertaken to determine the cause of these serious abnormalities. It is indeed gratifying to note that a national newspaper ***The Sunday Mail*** *has taken the trouble to send its reporters to the area to confirm our story. Their report appeared in the July 29th, 1990 issue of the newspaper and contains some excellent though heart-wrenching photographs. We reproduce the report in full along with some of our own photographs.*

Ramesh is a ten year old boy who developed a high fever a year back. Soon his body started developing tumours accompanied by undue loss of weight. His mother, Motian Bai, says that they mortgaged their land for treatment of their son. But it was to no avail. Ramesh's health has continued to deteriorate, and today he is so emaciated that he stands with the support of a stick. A sobbing Motian Bai says: "I don't know what has happened to the village in the last three years. People are constantly falling ill."

A few steps away from Motian Bai's hut, a 35 year old Balu Bhil sits forlorn. He has still not been able to come to terms with the amputation of his right foot. It had first started with an itch and then his toe started swelling. By the time he was taken to the hospital, the situation had come to such a pass that the doctors decided to sacrifice his right foot to save his life. His brother, Lalu, moans: "It is all because of that plant. We were very sturdy people. But all our illnesses must be due to radiation of the plant."



Balu Bhil and his feet

Radiation is indeed the only English word the villagers of Jharjhani know. They can't even comprehend its nuances. But they harp on the fact that the Rajasthan Atomic Power Station (RAPS) and Heavy Water Plant (HWP) at Rawatbhata have become the bane of their existence. The villagers appear to imbue supernatural power to the word, radiation. But are the villagers suffering due to radiation from the atomic stations? This is **hard to tell,** though some experts say that the reason probably lies in the pollution caused by the probable dumping of chemical waste than the radiation from the plant *per se.*

Recently, a team led by Dr. Sanghamitra Desai Gadekar, had visited these villages and had opined that such high incidents of tumour in a single village could only be ascribed to radiation. She had further claimed that the incidents of cancer among RAPS workers and their women folk can only be due to radiation, which has to be far more than the official claims.

Indeed the last three to four years has seen the birth of deformed children — a boy without an ear, a child without a hand, another with an overgrown skull and many with twisted legs. Some disconsolate women complain that children were born, did not grow an inch for the next six months and died subsequently. The villagers have stopped being surprised by such facts like a child with toes stuck together.

The elders are shocked by the way the children of the village start losing weight and fall ill. They complain that most of them too contact fever and skin diseases hitherto unknown to them.

It is indeed a village of disease and deformity. But Jharjhani is not the only place to be afflicted by mysterious malaise. For, a few kilometres away from RAPS the villagers of Tamlav have similar complaints. Chatturbhuj Singh, for instance, says that ailments of various kinds have become a feature of their existence only in the last five years. Said he: "It was never like this before. Now everyone complains of pains and skin problems."

The villagers of Jharjhani also point out that there has been a depletion in the number of livestock in the village. Kunwar Lal, who has been residing in the village for the last 25 years, said: "Not one of my hundred goats are alive today.

They all died one after the other in a span of three to five years." Chatturbhuj also points out that the number of cows has been dwindling over the last few years. Said he: "Only 500 cows out of 6,000 survive today."

Most villagers in unison blame RAPS and HWP for another new but depressing feature of their existence — weariness, body aches and lack of appetite. In fact, extreme weariness is one universal complaint of the villagers here. Said Madan Lal of Jharjhani: "We feel tired all the time." He and his friends say that even after a good sleep in the night they find it extremely difficult to get up in the morning. Madan says that even though their eyes open up early in the morning they are unable to get up from the cot because of extreme wean ness. "We find it bewildering. We are sturdy people who work in the field, but now we find it extremely cumbersome to raise ourselves from the bed," he explains.

Couldn't their complaints of illness and weariness be due to malnutrition? The villagers answer that neither their dietary habits have changed nor have the quantity of food intake. And then they ask: "But why were we not falling ill earlier? Why are our children increasingly being born deformed?"

In fact, the absence or lack of hunger and weariness is even the complaint of people residing in Rawalbhata town.

According to a top RAPS official, who agreed to speak but did not want his name to be taken as he did not have the permission from the ministry, said that he found it extremely surprising that they should be blamed for the present situation. "We have never conducted any tests on these villagers. But we do monitor our workers who are exposed to ten times more radiation than the villagers."

What does the medical data of RAPS show? It reveals that 30 workers or their children and wives have died of cancer ever since RAPS started operating in 1973. The approximate number of people who have worked in the staff is put around 4,000. What this official failed to mention was that there are another 10 people who have been reported to be suffering from cancer.

The official, however, clarified: "I must add that only one person can be said to have died of radiation. And anyway there is nothing abnormal with the number considering that the figure of cancer deaths at our plant is 1/4th of the national figure." But the fact according to Dr. Dhirendra Sharma, a professor at JNU, is that even a single death due to radiation is a matter of concern and provides ground for further investigation.

The official says that the plant cannot be said to have disrupted the life of the villagers as RAPS has increased the radiation in the environment only marginally. Said he: "The natural radiation in the environment was 80 mr and the plant has only increased it to 81 mr. Theoretically, contamination of the environment due to radiation is impossible. The diseases could be due to socio-economic factors." This official also said that RAPS workers, unlike the villagers, have never complained of weariness and bodyaches.

But this claim is pooh-poohed by the workers themselves. Most of them, however, were not willing to speak on record due to fear of retaliation from the management. But J.C.Gupta, a worker at RAPS, said: "I assure you that every one of us feel the same kind of weariness as complained by villagers. Besides they can hardly claim to examine the workers deligently. I have been medically examined thrice in the 18 years of my service at RAPS. The health of the workers has been deteriorating over the years. Like the villagers, there have been cases of deformed children being born to RAPS staff too."

While the workers allege that safety regulations are not adhered to and that some chemicals were dumped in the lake which supplies water to the village and the town, the official says that they have not violated any safety rules. He further pointed it out that it would probably be good to get the villagers examined and a survey conducted to put the controversy to an end. No one believes us, he complained.

Incidently, such medical surveys abroad are the combined responsibility of the Ministry of agriculture, environment and health. Shouldn't this be done in India too?

Ajaz Ashraf
Sunday Mail, July 29, 1990

CHERNOBYL:
A DOCUMENTARY STORY
lurii Shcherbak
Canadian Institute of Ukrainian Studies
University of Alberta, Edmonton 1989

This little (168 pages) book is the first eyewitness account of the Chernobyl accident and the events succeeding it to reach us. It was first published in the Russian magazine *lunost* in 1987. However, it was only in 1989 that an English translation was published by the Canadian Institute of Ukrainian Studies. The fact that this important bit of evidence has taken more than three years to come to our notice is a sad commentary on the 'global village'.

In some ways this delay has outdated some parts of the book. The writer, Dr lurii Shcherbak, is a medical doctor and a successful author in Ukrainian with nine books already behind him. His humanism and his sympathy for the common people is apparent throughout the book. Also transparent is the fact that he is a communist and a believer in the inevitability of nuclear energy. Chernobyl to him is "the final warning". Humanity must change itself — (evolve in to a new breed *Homo-Nomistakus* - Editor) — to become fit to live in the nuclear age. As Dr. Shcherbak put it, "Man must learn to co-exist with nuclear energy". In the foreword to the book, it is mentioned that Dr Shcherbak is in the process of writing an expanded version. It would indeed be interesting to find out if the events in Eastern Europe as well as the unending nightmare of Chernobyl have made him change his views over the last three years.

This said, it must be admitted that this is indeed a splendid book, spellbindingly written. Great calamities are like a giant searchlight. They illumine both the good and the bad in human nature. Like Dickens said of the French Revolution —"It was the best of times. It was the worst of times."—It is not often that one gets a book that tries to describe both these aspects. Of course, Dr Shcherbak lays greater emphasis on the heroism and the self sacrifice rather than on the petty minded selfishness but that is as it should be. The words of simple folk -who did their duty without any fuss while staring death in the face, simply because the task had to be done - have an incredible strength and beauty and uplift the spirit.

No price"iS" mentioned on the book and it is a great pity that the book is not easily available in India.

Excerpt

"Myshko Holovnenko, the driver, set off without apause and I set out second. There are two engines in our brigade. I was in one and he in the other. Well, you know, it often happens that when we set out we don't close the doors, and the doors are glass, and often the wind breaks them. So, normally the one who comes out last must close them. Pryshchepa and I closed the garage. I thought to myself: I'll catch up with Myshko. I've got a ZIL-30. So off we went and I chased him around 80 Kilometres an hour. Above my head the walkie-talkie was cracking, he was calling Ivankiv and Poliske out, the traffic controller was calling us out. I could hear that this was a real alarm call. I thought that it was really something serious..."

"Then I caught up with Holovnenko's engine, so that there would be no confusion over the building, so that it would be two engines together at once. We drove up. As soon as we were there, we could see the flames. It was like a cloud with red flames. Pryshchepa said: "Well, grandad Hrysho, there will be lots of work." We arrived.lhere ten or fifteen minutes before two o'clock. We got out — where now, then? We surveyed the area. Graphite was scattered all around. Myshko said: "Graphite, whats all this?' I kicked it away. But a fireman on the other engine picked it up. "It's hot," he said. Graphite. There were various pieces, big and small, pieces you could take in your hands. They had fallen all over the road and we were trampling all over them. Then I saw Pravyk run up, the lieutenant who died. I knew him. I worked two years with him. And my son, Petro Hryhorovych Khmel, is a guard chief, just like Pravyk was. Pravyk was chief of No.3 guard, and Petro of No.1. They finished their education together.. .And my second son, Ivan Khmel, is the fire brigade inspection chief for the Chernobyl region."

"Yes, so Pravyk ran up. I asked him: 'What now, Voloda?" And he said: "Lets get the engines on the 'sukhotruby.' Over here." And now the engines from the brigades No.2 and No.6 came up and turned towards us. We had two and they had three tank trucks and a mechanical ladder. Five engines on this side. All together! We moved the engines up to the wall onto the 'sukhotruby'. Do you know what 'sukhotruby' are? No! They are empty hoses to which you have to connect the water and then drag them up there, on to the roof; and we had to take hoses, and join the hoses and put out the flames."

"We set the engine on the 'sukhotruby really close up, we had a very powerful engine, Petro Pyvovar's from No.6 on the hydrant next to it; there is no longer any room for mine there. Then Borys and Mylola Titenok and I said: "Let's have a hydrant!" Well, they found us one, and that was difficult at night. During training we knew that our hydrant was on that side according to the plan, but it turned out that it was on this side. We found the hydrant drove the engine up close, quickly threw the hose out, and they — Titenok and I think Borys, I can't remember — rushed forward to Myshko's engine. Three hoses twenty metres each, that makes sixty metres."

"We didn't have much idea about radiation. AN the workers didn't have any idea The engines delivered the water, Myshko filled the tank with water, the water went up and then those lads who died went up. They scrambled up there using the step ladder. I helped them set it up, and it was done very quickly, all this was done and 1 didn't see them again.

THE POWER OF THE POWERLESS

Ordinary people all over the world have suddenly realized that they cannot wait for governments to come up with solutions to the real problems of everyday life. In fact they have found that governments are a major cause of the problems in the first place. Thus, in the East as well as in the West, in the North as well as in the South, people are putting things right on their own. A few inspiring examples....

'Dissidents' in Power

Something quite new is happening in Czechoslovakia these days. It is not the collapse of the communist system to which I am referring, although this phenomena is of undisputed historic importance. It is, rather, what is taking its place. Under the leadership of President Vaclav Havel, playwright and humanist, simple and extraordinary, the "anti-politicians" (as they called themselves, the "dissidents," as we insisted on calling them) are taking over. How does an "anti-politician" function in the world of politics? The answer is stunningly simple: according to principle, the principles of fundamental humanism and individual moral responsibility.

The first acts and pronouncements of Havel and his new cabinet can serve to illustrate. For example: Havel has declared that Czechoslovak internal secret police are to be abolished and dismantled. Not reformed, not renamed, not justified according to any "reason of state," but simply disbanded —not to be replaced. The new Czechoslovakia has no need for a secret police to spy on its citizens. Contrast this simple and straightforward approach with the wrangles in East Germany over the very same issue (when the dreaded "Stasi" were apparently going to be reconstituted as "Nasi"), or in the United States, for the matter, where the surveillance of U.S. citizens by FBI has long been an issue of controversy.

Similarly, Jiri Dienstbier, Czechoslovakia's new Foreign Minister, has announced that Czechoslovakia will no longer be engaged in the production of weapons for export. No studies were commissioned to look into the ..question of lost profits (and they will be considerable: arms sales averaged close to a billion dollars per year for Czechoslovakia during the 1980s). Weapons manufacture is simply being stopped because it is inimical to the nature of the new state.

Perhaps most revealing of the depth of Havel's humanity and commitment to non-violent solutions was his "controversial" apology to Germans who suffered in the forced deportations of virtually all Germans (about three million people) from Czechoslovakia's Sudetenland at the end of World War II. Havel refuses to repeat the usual and popular justifications and excuses based on German atrocities against the Czechs between 1938 and 1945. His apology, like all his pronouncements is simple and exquisitely humane. In the same vein, Havel appealed to the Romanians to spare the life of toppled dictator Ceausescu and has spoken out in his own country strongly against vengeance on the communists.

How is it that Havel has remained so calm and assured in the midst of his sudden "elevation" from dissident to President? In an appearance on American television his brother, Ivan Havel, answered that Havel has *never* sought political office, and does not regard it as any sort of pinnacle in his life or career — or as fundamental to who he is. In short, being President has not changed him (as we can see from photographs of a familiarly rumpled and jean-clad Havel in his President's Office). The uniqueness of Czechoslovakia, even in the midst of all that is new in East Central Europe, is that rather than challenge the communist political ideology and structure with an alternative political ideology, Havel and Company are challenging politics *itself* (the organisation of power by human beings over each other) as altogether inappropriate for and detrimental to human society.

In his famous and seminal essay written in 1977, 'The Power of the Powerless," Havel clearly states the essence of his "anti-political" philosophy. The power of the "powerless" in any society (including the totalitarian or "post-totalitarian" states of Eastern Europe) lies in the refusal to "play the game," the refusal to compete for power. The power every individual has to live one's own life *as if a* free man in a free society. In the living of such a life, one becomes a free man, as Havel was a free man even during his years in prison, even now as President, even as those who imprisoned him were not: they were trapped as we now see so clearly, by their commitment not just to a political ideology, but to the very notion of retaining power.

There has been much discussion in the recent past of the possibility of a "third way" (as an alternative to the tired dichotomy of capitalism vs. socialism) emerging in Europe. Some saw it in "Socialism with a Human Face," the Czechoslovak experiment of 1967-68; others saw it in the prospect of a "convergence" of the two systems, each adopting the best aspects of its opposite to correct its *own* failings. Today, many believe that the "collapse of communism" signals the victory of capitalism. These people (economists, in particular) tell us there is no "third way."

Neanwhile, back in Czechoslovakia, in the very heart of Europe, Vaclav Havel finds himself President. Talk about a "third way" has ended (there is no time for it *now)*, but it *is* being lived. Simply, profoundly, humanly. By living "as if" there is a third way, the Czechoslovaks are creating it.
Anita Shelton
The Accorn
A Gandhi an Review Vol. 5 No. 1 March 1990.

Indigenous Uprising in Ecuador

On 28 May, 1990 about two hundred tribals occupied the church of Santo Domingo in Ecuador's capital Quito. They presented the government a petition of 16 points concerning the rights of the indigenous population of that South American country. The government, however, reacted by sending in the police to surround the church in order to solve the 'crisis'.

The opposite happened: On the evening of 3rd June, tribals in the mountainous Andes region and the jungle areas of Amazonica blocked roads, occupied squares and declared an 'indigenous uprising' (levantamiento indigena) between June 4 and 6. With this expression they placed their action into the tradition of the big indigenous revolts of the eighteenth and the nineteenth centuries. The government was forced to negotiate.

Forty-five percent of Ecuador's population belong to nine indigenous communities which have partly managed to preserve their traditions and social structures. The 1980s saw a revival of the indigenous movements and rapidly the indigenous population became the most highly organized sector of the society.

At the same time, the slow down of agrarian reform, no development of the educational and health situation in rural areas, a total of 72 land disputes with indigenous communities, and the growing encroachment by colonizers and industry (oil, resource exploitation) on indigenous lands in Amazonica have created awareness among the indigenous people. In tact, today only ten percent of the cultivable land actually belongs to the tribals. The main demands of the uprising were: a solution to the land disputes, granting of land rights to the communinities and the transformation of the state into a 'pluri-national' system. The demand to recognise the indigenous medical practices, among others, demonstrates the growing cultural self-awareness of the tribal population.

In 1492, Columbus 'discovered' America. European colonizers benefited from this discovery. The uprising marks the beginning of the commemoration by the tribals of five hundred years of foreign domination. It is remarkable that tribal organisations have demonstrated their political maturity by remaining completely nonviolent, by not allowing political parties to use the events for their own ends and by developing concepts for a total transformation of society.
Source: SERPAJ-AL, Guayaquil;
Hoy Daily, June 5—10,1990

Perestroika in Practice

An unprecedented confrontation between the public and the Navy took place in the Soviet Far East after a local newspaper" *Voskhoo"* wrote that the military had decided to use a harbour close to the city of Sovetskaya Gavan and the village of Vanino as a "chopping block" for decommissioned nuclear submarines attached to the Pacific fleet.

There was immediate explosion of public indignation. The official reaction too, was quick. At a hastily convened meeting of the Vanino District Communist Party committee, Anatoly Klimov, the first secretary reprimanded the editorial board of the newspaper for what he termed its "inventions". At an emergency meeting of the presidium of Sovetskaya Gavan's Soviet of People's Deputies, Yuri Savkin, member of the naval garrisons political section, shared Klimov's sentiments and tried to placate people's fears. "We haven't received any order to dismantle the subs' heat-emitting elements (nukespeak for nuclear fuel)."

But in contrast to the political instructor, the naval specialists did not try to lie and spoke frankly. "We have orders from the fleet commander to unload nuclear fuel from the reactors. The planned schedule for the dismantling is ready. The work, though it will inevitably increase radiation is in principle, safe."

The deputies however, did not share in this official optimism. Physicians cited the district's already greatly increased cancer rate, especially among children, and one angry housewife, speaking on behalf of other mothers, demanded that the Navy remove all its nuclear subs, and that the Tatar Strait be turned into a nuclear-free zone.

A non-sanctioned meeting was held in Vanino on May 18, 1990. It was the first of a whole series.

The speakers are quoted In local newspapers as having said: "We are tired of living in fear" and "How can we believe the specialists after their many years of covering up about Chernobyl."

In the beginning of June, Mikhail Gorbachev, said in a TV interview in USA that " We have amassed so many weapons that we don't know how to get rid of them."

Over 40 percent of all Soviet nuclear submarines have been in service for more than 20 years and will have to be retired on a mass scale. But nobody in the world knows what to do with nuclear subs, how to disassemble their reactors and where to bury them. (Why what's the problem? Lease them to India, the land of Buddha and Gandhi -Editor). In short, by removing the threat of nuclear war, we have become captives of another threat — global pollution in the form of nuclear waste. It was not inexpensive for us to arm but, judging by everything, it will be even more costly to disarm.

In the meanwhile, the energetic protests of the coast's hundred thousand population forced Vladimir Kuroyedov, chief of Sovetskaya Gavan's naval garrison to stop, at his own risk, the operation ordered by the commander of the fleet. He even allowed public representatives to watch over the subs where the work had been planned. A specially elected strike committee called off its planned general strike this June and so defused an explosive situation. Resolutions of meetings were sent to fleet HQ telling them that they had until July 1 to announce when they would be removing the subs from Sovetskaya Gavan.
Stanislav Glukhov
Moscow News June 24—July 1, 1990.

The American Dream—2

Over the past year massive experiments in nonviolent resistance have erupted in two rural counties in upstate New York. The people have mobilized to protect their communities from the threat of nuclear waste. Both Cortland County in Central New York and Allegany County in the southwest corner of the state are plastered with antinuclear posters, signs and billboards. Thousands of citizens have entered the activist world, many for the first time in their lives. They have written letters, put orange "No Nuclear Dumping" posters in the windows of their homes and cars, demonstrated, and physically blocked state officials from inspecting the proposed sites. The level of excitement and anger has been tremendous as these newly awakened activists have begun to recognize their power and responsibility.

In 1988 Governor Cuomo appointed the Low Level Waste Siting Commission to locate a site for a dump and decide upon the disposal method. The Commission soon settled down on a 'short list' of five specific sites, two in Cortland County and three in Allegany County. Nobody has believed the Commission's claim that they can build a dump that would pose no threat to the host community.

The selection process is currently at an impasse. Massive non- violent resistance has stymied the Commission's efforts to inspect the sites and move forward with the selection process. In their six attempts to perform on-site work, they have been prevented from getting near the sites four times and twice they have been surrounded and stopped after reaching the sites. The Commission has publicly admitted that they are unable to carry out their task and have sought to increase legal penalties for obstruction.

Ultimately the value of the movement will be decided by its long term impact. Will people see and understand the connections between environmental destruction, social oppression and an economic system based on profit? And will these people retain their commitment or will they go back into their pursuit of the American Dream?
Andy Mager and Kath Buffington
NONVIOLENT ACTIVIST Vol.7 No.5
July/August 1990

lulling One's Own

The atom bomb which was dropped on Nagasaki killed many thousands of Japanese. But it along with other nuclear weapons used for tests during the "cold war" also killed and continues to kill many Americans too. We have previously carried a number of reports in *Anumukti* (see Vol.3 Nos 2, 3 and 4) regarding the health consequences of the radioactive iodine releases at the Hanford facility belonging to the U.S. Department of Energy. These reports have included first person accounts of the suffering caused to those who were children during the years 1945-56, as well as a review of a book which dealt with just this problem. On July 11th, 1990 the U.S. Department of Energy admitted publicly for the first time that the doses were high enough to have caused illness including cancer in nearby residents. This belated government admission presumably opens the way towards compensation of the victims through lawsuits and legislation.

The Unending Nightmare

British experts and equipment are being sent to Gomel in the Soviet Union as part of an international effort to assess whether another three million people need to be evacuated as a result of the Chernobyl accident four years ago.

The Russian authorities finally agreed to allow access to all the information available about Chernobyl after fears that up to one million children may be suffering severe health effects. The fallout of Chernobyl is now estimated to be 50 times greater than that of the Hiroshima atom bomb.

Five scientists from the International Atomic Energy Agency (IAEA) have been to the Soviet Union to establish what needs to be done to find out the full effects of the disaster.

The most serious problem is that more than three million people live in contaminated areas and have ingested radioactive material but no one yet knows what effect this is having on them. The Soviet Union has little of the specialised equipment required. Boris Goudima, foreign affairs for the Ukraine told the *Guardian:* "We are still only realising the true extent of the tragedy. At first the Russian authorities did not tell us in the republic what was happening and we could not find out the extent of it because we had no equipment to measure it. Now we can see it for ourselves. AH the children in the contaminated areas have swollen thyroids. They do not laugh or run or play like children, they sit around in groups like old men."

In the Ukraine five million hectares of farmland and 1.5 million hectares of forest are contaminated. Despite some 90,000 being evacuated, there are still some 1,600 towns and villages occupied in this area, with a population of 1.5 million. This year another 15,000 people will be resettled but another 150,000 with seriously affected thyroid glands need to be removed. Radioactive hot spots are still being found.

The neighbouring republic of Byelorussia has 20% of its farmland and two million of its population contaminated. Mr.A.N.Sytsjev, a foreign minister, said: "The consequences of the Chernobyl disaster have turned out to be much larger and on a more serious scale than was perceived by many, including prominent scientists and experts."

So far only 173,000 people, including 37,000 children, have had extensive health checks. A further two million need them. Britain is being asked to supply individual dose meters and other equipment as well as medical and nuclear scientists. Hans Meyer, spokesman for the IAEA in Vienna, said: "The Soviet authorities have at last agreed to put all their cards on the table. We shall be establishing the headquarters at Gomel between the two most damaged areas in the two republics to make the first proper assessment of the real scale of the damage, It is a daunting task."

Women in the contaminated areas have no access to uncontaminated baby foods because of lack of relief funds.

Mr Meyer said that the IAEA had to assess the scale of the problem and then make recommendations. Its report is expected to be ready by the autumn.

Paul Brown
The Guardian May 21,1990

While going through the account of your cycle yatra I had a strange feeling which I would call healthy jealousy. Every day there are several reminders of the prison that I have created around myself but the cycle yatra also reminded me of the possibilities of fulfilling childhood dreams of adventures with a much greater meaning! I don't know exactly when, but some day I am bound to join you people in your yatra.

Sanghamitra's report on the health of people around Rawatbhata reactors is so shocking that one feels at a loss for words. I have got it xeroxed and given it to some people here. I am also going to send it to all the newspapers.

During the last few months I have been trying to gather more information on the Narmada project. It is very distressing to realise that the Gujarati press refuses to see the problem of rehabilitation .as it really is, Even if we accept that the 19 villages of Gujarat can be rehabilitated, it is no more than a small fraction of the task. I find the stand taken by the Vahini group at Mangrol also very disappointing. They are perhaps doing a very good job of monitoring the rehabilitation of villages in Gujarat but they say nothing openly of the just demand of the 6 villages of Kevadia and other project affected people. It is said that they have serious differences with the activists in M.P. and Maharashtra, but is it not clear that none of the state governments have so far identified the land required? And what if even after the land is identified, the villagers refuse to move? One hopes that as time passes the real nature of the project will become clearer to those who believe it is inevitable and that there will be a united front of all activists who will support the villagers who will be refusing to move.

I have recently come in contact with a group of young students who call themselves "Nature Crusaders" and they have shown great interest in the environmental aspects of the Sardar Sarovar Project. One of them, Chandrakant Patel, has done a survey of the waterlogged lands in Kheda district. During our next meeting I intend to suggest that we start a group to discuss issues related to nuclear energy.
Kersi Sabavala
Sigma Equipments
886/2 GIDC, Makarpura
Baroda 390010

Since the defeat of Dr. Karanth in the last elepution, CANE (Citizens Against Nuclear Energy) and the rest of the antinuclear movement in Karnataka seemed to have gone into a coma. But recently there have been some attempts to revive the movement. Now there is one immediate issue about which concerted efforts are required. The petition filed by Dr. Karanth and others on Kaiga has come up in the Supreme Court for hearing. We have formed a support group in Bangalore to back up the efforts of the legal team in Delhi. Unfortunately, the lawyers handling the case in Delhi are not knowledgeable about nuclear power in general and Kaiga in particular. V.M.Tarkunde is to present our case in the Supreme Court and has to be thoroughly briefed on the subject. On July 9th, when the court reopened after the summer vacation, it served a notice on AEC, NPC, et.al. to submit their arguments in two to three weeks. After which the case is scheduled for actual arguments on August 28.

We are trying to send as much information and documents to our lawyers in Delhi. In that connection, it would be useful to have detailed reports of radiation effects around Rawatbhata. From a legal point of view radiation effects infringe upon the right to life. So please send as much data as possible in whatever form it exists. Some photographs have been published in *Anumukti.* Congratulations! They might be useful in court.

The April issue of *Anumukti had* a write-up on the fifth BEIR report. There were also references to other reports which implied that the effects of low-level radiation have been grossly underestimated in the past. These too would be useful.

We have been told that social, ethical and financial arguments are not decisive in a court case like this, but respectable and authenticated studies and arguments based on the law have to be invoked. We will put in our efforts and hope for the best.
San jay Havanoor
61, Central Excise Layout,
Vijaynagar, Bangalore

I am sending a copy of a news item which appeared in *Moscow News.{See* Page13-Editor). *Financial Times* has recently published a gist of a report by U.K.Energy Commission which criticises the Department of Energy in that country. The same paper also carries a report on the problems of the power plant manufacturing industry in Czechoslovakia. I think both these reports will be of interest to *Anumukti* readers.

The Bengali version of *Nuclear Free Seas* by Greenpeace is out. This book is dedicated to Narayan Desai, Shyamali Khastagir and Dr.Shivaram Karanth. (All dedicated antinuclear activists -Editor) The introduction is written by the International Campaign Coordinator of Greenpeace. I do not know how much money I will get as royalty from the book. But whatever it is, the royalty will go to *Anumukti.*
Niranjan Haldar
79, R.K.Ghoshal Rd., Calcutta 700042

I am simply feeling sick going through Sanghamitra's report on Rawatbhata in your June/July issue. How long would our scientific community and so called intelligentsia remain spectators? I salute the *Anumukti* team for keeping the feeble flame of protest still burning.

At present I am trying to write a small book along with Dr Subhendu Dasgupta and one of our friends on India's growing military-industrial complex. We plan to write it in Bengali so as to reach a wider section of people.
Dipankar Dey
28, A.V.L. Street, Calcutta

Two days ago, we had a CANE meeting, mainly to discuss how to counter the Nuclear Power Corporation's 1 /4 page ads that have started appearing in the press. We shall be meeting shortly again, to finalize the drafts and later I will post it around the country.

However, the main reason for this letter is, can you send me a xerox copy of the letter sent to N.P.C. by Sigma Equipments which appeared in your last issue. What I am visualising is to circulate this letter to members of the Chamber of Commerce in Karwar, Hubli, Dharwad and in Goa.
Hemachandra Bassappa
21, Railway Parallel Rd. Nehru Nagar
Bangalore 560020

The June/July newsletter is an improved issuel Its contents, as dramatic as they are easy for lay readers, should do some great service.

Can I copy from *Anumukti* and send the text as letters to the editor with reference to the newsletter? Do you send Anumukti to institutions and ministries in India? To schools, universities and technical centres?

S.Sharma-Hablik
32 Rue Suffren
Pondicherry 605001

Any material which appears in *Anumukti* can be copied with or without reference. One of the purposes of *Anumukti* is to give wide coverage to the information contained in it and we would be only too happy if our readers were to perform this service. We send one complimentary issue to anyone whose name is suggested by any reader. Due to financial constraints and also on ideological grounds we do not give *Anumukti* gratis on a regular basis.

The following is the copy of a letter written to Shri V.P.Singh, the Prime Minister of India.

The 1989-90 annual report of the Department of Atomic Energy (DAE) has a map of India showing the location of all DAE installation and facilities. This map, however, makes no reference to DAE's massive installation — Rare Earths Material Plant at Ratnahalli, near Mysore. Several times in the past, the residents of Ratnahalli and Mysore have alleged and protested that this is a secret installation to produce enriched uranium towards a weapon's programme. Are their' fears and suspicion justified?

Secondly, the omission of reference to this installation raises several serious questions with dangerous implications in view of the Treaty with Pakistan on the Prohibition of Attack Against Nuclear installations and Facilities. Article II of this treaty states:
"Each contracting party shall inform the other on 1st of January of each calender year of the latitude and longitude of its nuclear installations and facilities and whenever there is any change."

Will you please kindly explain to the people of India as to what is going on at Ratnahalli. The people of India have not given you or anyone else the mandate to make a nuclear weapon. In a recent interview you are quoted as having said that in the future you shall deal firmly with situations. May we plead with you to enforce this firmness with the Department of Atomic Energy and the Nuclear Power Corporation and get someone to brief you on their facilities.

Hemachandra Basappa
21 Railway Parallel Rd., Nehru Nagar
Bangalore 560020

Anumukti strongly condemns the testing of a new missile named "Akash" by the India.

We believe that research and production of new weapon systems do not help to reduce tension and the possibility of war in South Asia. Investment into war industries goes hand in hand with reduced efforts in the social and economic sphere and are thus bound to sharpen social conflicts within the country.

Keeping these points in view we suggest the following action: Please write letters to Dr. Raja Ramanna, Minister of State for Defense, asking him to reconsider the whole missile programme and to divert the weapons research budget to socially useful (that excludes nuclear energy) civilian research. Please send copies of the letter to Shri V.P.Singh and to your local news media. We would appreciate if you could keep us informed about any reactions and send us newspaper clippings.

Subscription Rates:

Rs.25/-per year South Asia
U.S.$ l5/-per year air mail overseas
(Rs.200/-per year If paid for in India)
Please add Rs.6 for cheques
Drafts should be drawn on State Bank of India Valod (0531)

Editor: Surendra Gadekar

Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi. Dist.Surat. 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat-Printery, Ahmedabad.

PRINTED MATTER ***BOOK POST***

Volume 4 Number 2 *October/November 1990*

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 2 *October/November 1990*

> *"People have to operate* nuclear power *plants no* matter *how much automation we introduce. People are forgetful, often they are* irresponsible and quite a *few of them suffer from deep-seated* irrational tendencies *towards hostility and* violence. I believe *that the confident advocates of the safety of* nuclear power plants base their *confidence too* narrowly on *the safety that is possible to achieve under the* most *favourable* circumstances, *over a limited period of time, with a corps of* highly trained and *dedicated* personnel"
>
> J.T. *Edsall*

When anything seriously untoward happens in the nuclear system anywhere in the world, the first reaction of nucleocrates elsewhere is, "IT CANT HAPPEN HERE!" After Chernobyl disaster in 1986, this litany was heard all around the world, may be even in other parts of USSR itself! It would not be an overstatement to say that at least for the Indian nuclear establishment frequent repetition of this mantra has been its only response to Chernobyl. Even almost four years after the event, Dr. M.R. Srinivasan, the then Chairman of the Atomic Energy Commission, wrote :

> *"After the* Chrenobyi affair, *the question has often* been *raised about whether or not* a similar *accident could happen in the* Indian nuclear power *plants. My* answer *is again 'no'...* The *accident at* Chernobyl *took place* mainly *because of the total disregard shown by the reactor operators for safety* rules and procedures, and'the inherent *design deficiencies."*

One of the presumptions underlying this preposterous assertion is a feeling that 'our' operators are some how better than 'their' operators. Mr. M.R. Srinivasan has often in the past said so in so many words. "Operators in India, unlike their counterparts in the West, are graduate engineers who are well trained in all aspects of reactor operation and can analyse any problems that may arise during the running of the reactors." The establishment has assiduously tried to create an impression, that unlike the drug-taking, high-school pass, order disobeying nit-wits who man reactors elsewhere, the Indian 'scientists' who control our reactors are a dependable lot, who pay meticulous attention to safety and security procedures and can be relied upon in all circumstances. May be, by and large, this does describe the true state of affairs correctly. I just don't know for sure because the secrecy which surrounds these operations does not allow any outsider to come to any sensible judgement. But the crucial point is that nuclear energy is an unforgiving technology, which does not allow any by and larges. It demands absolute reliability from all. Designs, materials and personnel must all be, without exception, flawless. Therefore, the newsreport [See Box, Page 2) of an attempt by an employee to sabotage .some pressure gauges in unit-2 of Rajasthan Atomic Power Plant (RAPP) at Rawatbhata causes special alarm. The incident shows that despite all screeings and security checks it is possible for a petty minded self-server to have access to vital parts of the reactor and place in jeopardy the life of millions.

A reactor operator deliberately blew-up a military reactor in the US in 1961. The enquiry commission which investigated the incident found him to be emotionally disturbed due to lack of promotion and marital problems. But this finding was of little use to his two colleagues who died with him or to the 720 people who were contaminated in cleaning up the mess he left behind.

The most alarming aspect of the RAPP 'unusual incident' is the flaccid way it has been handled by the authorities. Unfortunately this lackadaisical attitude to safety is far too usual.

The Chief Superintendent of the Rajasthan Atomic Power Plant, G.R. Srinivasan has admitted that an attempt was made to sabotage the turbines attached to the plant but claimed that it posed no great danger to the surrounding community. A team from the Central Bureau of Investigation has conducted an enquiry into Ine incident.

On 16th August, 1900 both the units at RAPP were under shut down for their annual maintainance. At 12.10 PM, a technical employee Mr. B.K. Jacob put a large bundle of cotton waste into the lubricating oil pipline of one of the turbines of unit-2 causing an obstruction. An engineer and another employee of the plant saw Mr. Jacob doing this and he was caught by them in a very dramatic, fashion. Soon alter senior authorities were informed of the incident

Under questioning Mr. Jacob admitted his fault and said that he had done it out of frustration at not getting promotion. He felt that due to the obstruction the unit could not have been started, and later he intended to 'discover' the obstruction and thus prove his capability for promotion!

Mr. Srinivasan said that there was no grave danger to the turbine due to this obstruction but it might have taken a few days to locate the particular pipe and that would have caused a severe production and monetary loss.

Desh Ki Dharati October 29, 1990 and Rajasthan Patrika November 2, 1990 (translated from Hindi)

Attention Koodankulam : VVER Reactors Found Unstable

According to an internal report from the Czechoslovakian Atomic Energy Agency (CSKAE), experience of the VVER 1000 reactors which are presently in operation in USSR and Bulgaria "confirms that operation is difficult to control" and the reactors are for that reason "extremely unstable." Among other things the automatic controls are "insufficient." The primary cause of the instability, said the report, is the use of two year fuel cycles which prevents use of burnable absorbers in the fuel. The resultant excess reactivity (in the core) is compensated by a higher boric acid concentration. This, however, "leads in some loading schemes to extremely undesirable positive values for the temperature reactivity coefficients."

Jargon Explanation

Each time a uranium 235 atom breaks it produces two large pieces (known as fission fragments) and sometimes two and sometimes three neutrons. These neutrons collide with other uranium 235 atoms and induce them to break. For a stable chain reaction as in a reactor one needs that one and only one of these neutrons on the average causes fission of an other atom. The key phrase here is : on the average. Since neutrons from any particular fission may of course get 'lost' — get absorbed by the fission fragments or water or tubing, reactor building, etc. Or else all the neutrons from a particular fission may cause other atoms to break. As the reaction proceeds, the conditions within the reactor core are continuously changing — the number of uranium 235 atoms are decreasing while the numbers of the fission fragments are increasing. Hence the neutron number control mechanisms need to be adjusted continually. Boron is a good absorber of neutrons. So since one wants the reaction to continue for two years without pause for reloading what is done is that at the beginning one keeps the number of uranium 235 atoms somewhat more than need be and also have a larger concentration of boron. As the reaction works itself through, the uranium 235 number will naturally decrease,and one can reduce the concentration of boron gradually thus keeping the overall neutron economy in good order. What the Czechoslovak's are saying is that in practice this procedure is not easy to control. For particular geometries of loading it may so happen that a lot of the concentrated uranium 235 may get together and as the reaction proceeds apace and accelerates and the temperature rises there may be a power surge like the one that rocked Chernobyl.

Officials at Gesellschaft fuer Reaktorsicherheit mbH, where experts from Czechoslovakia, the German Democratic Republic and the USSR are investigating VVER reactor safety, confirmed that the two year fuel cycles have been causing problems for other Eastern European and Russian reactor operators as well. According to one official, information available thus far shows that the reactor safety relevance of the WER 1000 core design problem is "not trivial" and that "axial fluctuations can occur in the core with high amplitudes and these are difficult to get under control." Local core temperatures, he said, can increases beyond allowed limits and boiling of fuel assemblies is possible. Besides the VVER 1000s presently in operation in the USSR, there are two in operation in Bulgaria and four under construction at Temelin in Czechoslovakia. The Czechoslovakian government, however, is considering cancelling the second two units and replacing them with reactors of Western design.

Source : WISE *News Communique* 337, 31 Aug., 1990

The Sterilized Zone

We hove *recently acquired a copy of Nuclear Off-Site Emergency* Response Plans *prepared* in the wake *of* the Chernobyl *disaster* in the Soviet Union in 1986. These plans have been *prepared by* the *State Level Emergency* Response Committee, *in consultation with* nuclear plant *authorities, National Level Emergency Response* Committee, *Atomic Energy* Regulatory *Board, Nuclear Power Corporation and Bhabha Atomic* Research Centre. The *plans have* been *issued in 1988, have not* been subjected to *any revision and thus represent the latest official* thinking on *this issue. Despite repeated* requests *for a copy (a* matter *of vital* concern to us, since *we live* uncomfortably close to a nuclear plant] the authorities *have not* seen *it fit to provide us with* one. *They have not denied us* our *rigjht to have it but have just gone an procrastinating for the last two years. We will be* presenting relevant portions *of the plan along with our comments under this* heading in *the next few issues. The* present article *deals with the assumptions that underlie* the whole planning process whereas the *future articles will deal with the specific protective* measures to be undertaken.

Planning Basis and Concepts

The following principlos shall form the basis of all nuclear offsite emergency planning and management :

The State through its designated agencies, has primary responsibility for the health, safety and welfare of all inhabitants of the state and the protection of property in normal basis as well as emergencies such as floods, droughts and fire and so on. Such emergencies also include nuclear offsite emergency for which this plan is made.

If nuclear emergencies are emergencies on the same footing as are floods, droughts and fire then why does Life Insurance Corporation and other insurance agencies not insure the public against nuclear disasters as they do in the case of floods and fire. In fact there is a specific clause in insurance policies absolving the agencies of all claims arising from a nuclear emergency.

Even though nuclear power plants and other nuclear facilities are designed and operated according to stringent safety standards and those in India have an excellent safety record, emergency planning must operate on the basis that mechanical failure and/or human error can lead to accidents of a magnitude resulting in unacceptable off-site consequences.

The 'excellent safety record' is unfortunately unknown to the public since the performance records of various nuclear facilities are classified information. It is only when an independent agency is able to analyse the records of all 'unusual incidents', forced scrams, leaks, spills, 'lost radioactive sources, etc. that one would be able to form a fair judgement as to whether Indian safety record is excellent, mediocre, poor or flunk..

The more severe a postualted accident the less likely is its occurence. An appropriate balance should be struck between risk and cost when assessing the level of emergency planning and preparedness required.

This principle is in effect saying that prepare only for small accidents, since large accidents are extremely unlikely. The neat inverse relationship between the probability of an accident and its severity applies only to "postulated' accidents. These are those accidents which have been foreseen by the designers, and then adequate safeguards have been taken to combat them. Unfortunately in the real world, the accidents that do take place are the ones not foreseen. One reason for this is the unpredictable 'human factor.'

Furthermore, the risk/benefit assessment methodology employed in this principle makes no sense. A better principle would be to have emergency planning and preparedness based on "worst case' scenario, irrespective of cost effectiveness. Certainly these high costs will be insignificant in relation to the lives and properly that could be saved in the event of a real accident.

Exposure to radiation shall be kept as low as reasonable achievable.

The key word here is 'reasonable.' An effort to reduce radiation exposure that might seem reasonable to a nucleocrat safety ensconsed in an office in Bombay may seem totally inadequate to a person living near a nuclear plant who is being exposed to radiation. So who decides what is reasonable!

As much planning and preparation as is practical shall be done in advance to unable a rapid, effective and efficient response to a nuclear emergency.

Again the key word here is 'practical' It seems to suggest that emergency plans should not be over emphasized since 'everyone will do what is necessary' in the event of an accident. Emergency plans ought to be more than mere 'guideposts' to effective action. They should be well known, well understood, and well practiced steps to emergency action. For example, when confronted with the criticism that the size of the emergency planning zones is too small, government officials all over the world usually respond that these zones can easily be enlarged if authorities at the time of the accident deem it necessary. Yet, this assumption fails to recognize the logistical and practical implications of such a decision since detailed planning in a non-zone areas is non-existent. The purpose of the emergency preparedness plan should not be to give the public a false sense of security.

Preparations shall include a cost-effective programme of public education for people who might be affected, to inform them of the plans and to help them cope with a nuclear emergency.

The programme of public education has been so cost-effective that it has incurred no costs at all. The public has no choice but to get educated on its own initiative if it is interested in its survival. For example, as I mentioned in the beginning, I have been asking the Kakrapar authorities for the last two years to give me a copy of this plan and they are yet to do so.

A policy of truth and openness shall be followed in providing information to the public and media during a nuclear emergency to discourage rumours and misunderstanding.

NO COMMENTS!

Types of Accidents

An accident in a nuclear reactor cannot result in a nuclear explosion. A typical nuclear accident that could cause a nuclear emergency - its probability being one in 10,000 reactor-years - is a Loss of Coolant Accident (LOCA).

This impressive figure of one in ten thousand reactor years has come out of a hat : Dr. Rasmussen's hat. Till 1975, nucleocrats used to claim that the chances of a core-melt were one in a million reactor-years. He devised a method of assessing accident risks of a nuclear power plant and came with the one in ten thousand figure for a core-melt and a one in million reactor years figure for an accident with wide dispersal of radioactivity. There are two problems with this comforting figure. Firstly, these risk analyses are plant - specific and there has been no claim from Indian nucleocrats that they have conducted these analyses an Indian reactors. Secondly and more importantly, reactors have not been obeying the dictates of risk analysis and have been having accidents far more frequently. Thus, the core-melt at Three Mile island took place after only 1,300 reactor years of operation while the Chernobyl disaster instead of waiting a decent fraction of million reactor years took place after only 1,800 reactor years.

Nuclear reactor containment is a system of massive concrete and steel barriers with a limited number of designed openings that are closely controlled and monitored. Although simultaneous failure of the containment system and a loss of coolant accident are highly unlikely, nuclear emergency planning is carried out to cope with even such unlikely dual failures in reactor safety systems to minimize public risk.

Reactor containments for all their concrete and steel, are not built to withstand all kinds of overpressures that can build up within. In case of a failure of the emergency core cooling system, there are good chances that the containment too shall fail. In fact a study in USA on Tarapur type Boiling Water Reactors found that the chances of containment failure were nine out of ten.

The serious nuclear accident for which detailed planning and preparation shall be done is one producing an effective whole body dose of 10 rem at a distance of 1.6 km from the nuclear reactor.

Radiation Hazards

Nuclear accidents could result in two types of emissions :

(a) An airborne emission, involving the release of radioactive material into the atmosphere.

(b) A liquid emission, such as the release of radioactive liquid into a river, lake or water course.

These emissions can effect the human body or animals externally or internally in the following manner :

(a) External exposure to airborne or waterborne radioactive material, or to deposits on the body, clothing, ground, building and other objects.

(b) Internal exposure due to irradiation from inhalation of radioactive material or the ingestion or radioactive material through the consumption of contaminated food and water.

In managing a nucler emergency the radiation hazards to be considered are :

(a) Initially, the main short term danger would be external irradiation from the radioactive plume. Lesser hazards would be inhalation of radioactive material, especially radioiodine (which would accumulate in the thyroid gland), or the radioactive material deposited on the body, ground and food.

(b) After the release has ended, the long term hazard would be from consumption of contaminated foods, espcially milk and water. Lesser hazards would exist from deposited or resuspended radioactive material.

The levels of radioactivity that are expected to occur offiste in a nuclear emergency are extremely unlikely to expose people to the risk of radiation sickness or other acute effects. The main risk that emergency plans seek to avoid is an increase in the long term incidence of cancer among the population*

Also hypothyroidism, loss of fertility, genetic disorders, allergies, asthama, spontaneous abortions, lowering of the immune system .... etc.

Protective Measures

The body can be protected from external irradiation by preventing or minimising its exposure to the radiation source, by distance, by limiting the time of exposure or by shielding.

Complete protection from internal irradiation can be obtained by preventing ingestion or inhalation of radioactive material. Once radioactive material enters the body, radiation exposure diminishes with its decay, and ends when the material is completely eliminated from the body.

In other words, don't breathe or eat. If radiocative materials do get into the body, there is no way to reduce exposure and all one can do is to wait the natural bodily processes expell the substance.

A special method of protection is available for the thyroid gland which absorbs and stores iodine. If there is a risk of radioiodine entorting the body, the thyroid's capacity to a absorb it can be reduced or eliminated by taking stable iodine before or even shortly after the radio-iodine enters the body. This is known as thyroid blocking.

The specific protective measures available for dealing with the radiation hazard in a nuclear emergency are :

(a) Sheltering
(b) Thyroid Blocking
(c) Entry Control
(d) Evacuation
(e) Decontamination
(f) Use of Protective Equipment
(g) Food Chain Protection
(h) Food and Water Control

Emergency Zones and Sectors

The area around a nuclear facility for which a nuclear emergency plan is made shall be divided into the following zones :

Contigneous Zone : 1.6 km radius from the nuclear facility.

This is the zone immediately surrounding a nuclear facility. An increased level of emergency planning and preparedness may be advisable within this area compared with the rest of the Primary Zone because of its proximity to the potential hazard. This is also called Exclusion Zone as residential habitation within this area is prohibited. This area is fenced and is under the full control and responsibility of plant management. Outside this fence of 1.6 km radius, the responsibility for the nuclear offsite emergency response rests fully with public authorities.

Increased planning and preparedness for an area in which nobody lives!

Sterilized Zone : Between 1.6 km and 5 km radius from the nuclear facility.

In this zone new growth of population development acitivity is prohibited by law {to be enacted) so as to restrict the population to easily transportable number in case of nuclear emergency. This zone is included in the Primary Zone. Area under consideration may be put under "Contonnment Board" or similar authority (proposed).

How is the prohibition on population development activity* to be enforced? By compulsory sterilisation! Parts of Mandvi (population : 25000) fall within 5 km of Kakrapar nuclear power plant, and there would be many such examples from other plant sites.

Primary Zone : Between 1.6 km. and 8 km from the nuclear facility.

In this zone it would be prudent to plan and prepare measures such as sheltering against plume exposure. Evacuation may also be required. Responsibility beyond 1.6 km is fully with state public authorities.

Secondary Zone : Between 1.6 km and 16 km radius from the nuclear facility.

This is a larger zone within which it would be produent to plan and prepare measures against exposure from ingestion of radioactivity. The Secondary Zone includes the Primary Zone. The distances will be taken from the reactor building/nuclear facility.

For the sake of comparisioa in USA the primary zone extends 16 kms and the secondary zone extends 80 kms from the reaction site. Even this is grossly inadequate as can be seen from Chernobyl. There, people within 30 km radius had to be immediately evacuated (primary zone); whereas food restrictions need to be imposed in hot spots' as far away as 400 km from the plant site.

See also the book review of Emergency Planning in Case of Nuclear Accident in this issue.

We *will discuss these special protective* measures in greater *detail in future issues.*

The mysterious Case of the Vanishing Subscriber

Yes, it is a great mystery to all of us. Has the nuclear establishment called it quits and gone to meditate in the Himalayas? Or does the coming of the new government herald a new nuclear free dawn? Or perhaps, God forbid, Anumukti has become boring, silly and full of misinformation! How come the subscribers list has shrunk almost to vanishing point!
Don't let Anumukti die a gruesome death, drowning in a pool of red ink! Send your subscription to our office (for the address, see the last page) today.

AN UNPRECEDENTED TRAGEDY

For the first time an official document — a decree of the USSR Supreme Soviet adopted on the eve of the fourth anniversary of the Chernobyle disaster — described it as the biggest calamity of the century, and a tragedy of the entire people affecting the fate of millions.

> *"Chernobyl was no doubt by far the worst accident that has taken place in the nuclear industry in the world. A Total of 28 deaths took place which is equivalent to two days loll of road accidents in Maharashtra only."*
> *Dr. A.K.De* - the *then chairman of Atomic Energy Regulatory Board.*

"Chernobyl was no doubt by far the worst accident that has taken place in the nuclear industry in the world. A Total of 28 deaths took place which is equivalent to two days loll of road accidents in Maharashtra only."
Dr. *A.K.De - the then chairman of Atomic Energy Regulatory Board.*

The crudest violations of technical procedure in operating the reactor plus its shortcomings and the unreliability of the equipment and control instruments have resulted in a hitherto unheard of tragody in the history of humanity. Deputy Yulia Drunina called it the apocalypse of our century and sharply condemned those who *"had in that* hour of *trial seated their* children into big office *limousines, while those of the non-nomenklatura* had been lined up *in the May Day holiday* columns and *led to city* squares to celebrate under *the clouds of radioactive dust."*

Blame for the inadequate measures taken at the time of the disaster and later, lies with the Ministry of Atomic Energy, the Ministry of Health and the State Committee for Hydromoterorology. These minitries concealed all information regarding the real state of affairs.

People's deputies asked many awkward questions in their speeches. Why is it that even today, information about the state of the health of the children continues to be kept secret ? Who is personally responsible for making the people stay in the contaminated zones ? On whose orders has the USSR Ministry of Health been turned into the Ministry for Opportunistic Propaganda ? And so forth.....

The position of the USSR Council of Ministers was : "Why delve into the past, when there are urgent problems of today and tomorrow facing us?"

"Thousands of people have become hostages of the disaster caused by 'Atoms for Peace'," said Deputy Igor Luchenok. Among them are those growing produce on contaminated land and those consuming it. And each one of us can potentially find ourselves in the latter, for contaminated fruit and vegetables, meat and milk, poultry and cereals, sunflower and flax are spreading all around to other parts of the country and the world, not without the participation of government bodies.

> *New evidence collected by the Byelorussian Acadmy of Sciencies indicates that the medical effects of Chernobyl disaster are much greater than has been generally predicted.*
> *The blood of pregnant women in Gomel, was found to have nine times as many severely abnormal ("dicentric") cells as that from women in a control area, Kalinin. Moreover, the frequency of multiple chromosome abnormalities is increasing. In Byelorussia as a whole the incidence of all recorded congential abnormalities since the accident has increased by* 70% *and that of major specified abnormalities by 50%. In Mogilyov, the development of nine year olds has been retarded on the average by about three years. In this area* 20% *of the children received a doze of 1,000 rads to the thyroid. Beylorussia has a population of over ten million. There has bean an increase in cancer registration of between a third and a quarter. Specifically, the number of thyroid cancers is increasing, and in Mogilyov region there has been a rise in luikaemia registrations from 22 in 1985 to 40 in 1988. There is also evidence from animal studies of a severe depression of the immune system.*
> *The Lancet* ; *May 5, 1990*

Some deputies with great urgency pointed out that if we repeated the mistakos of the past four years and did not take cardinal decisions, events could become unpredictable. "The psychological condition of the people has reached an irreversible turning point and the situation is fraught with social upheavals," Deputy Valeri Krishevich stressed.

Parliamentarians also said that against the background of Chernobyl tragedy's aftermath and the utter misery of tens of millions of our fellow citizens we could not afford such undertakings like countless seminars, conferences, symposiums and other formal functions which are unnecessary and burdensome to our bankrupt treasury. Couldn't we reduce at least for the time being, the number of various "shows", and festivals so inappropriate in our present economic and social situation?

Much criticism was levelled at science in general and individual scientists in particular, on account of their concept of "normal existence" in territories with per capita radiation dose of 35 rem, and also for their tendency to strictly classifying all information on the subject (and thus leaving then nation in the dark).

Deputy Vasily Belov stated that science which had allowed the Chernobyl catastrophe to occur was immoral, and the society which developed and encouraged such science was careless. "We are being spoonfed with promises of complete reliability of nuclear power plants. Yet, we have all become hostages of this deadly, devilish force - the atomic boilers which are spread across the land in great density." He cited many hushed up cases of nuclear plant disasters in various regions during the last fifteen years.

> *"Recent studies by Soviet experts show that some of the earlier predictions regarding the long term health consequences of Chernobyl and the number of people affected by the accident were way of the mark. I think we should compare the 32 human deaths due to Chernobyl with the over hundred people who have died due to the recent accident on an oil platform in the North Sea."*
> *Dr. M.R. Srinivasan in Sunday Observer of 24 th July, 1988*

Yevgeni Velikhov, Vice President of the USSR Academy of Sciences, and one of the topmost nuclear experts in the country, when given the floor, held forth about the "Chernobyl " charity" TV marathon, about how scientists had frequently visited the site of the disaster, and about the need to remove nuclear fuel from the "sacrophagus". Dr. Vlikhov stated that the problems of the polluted territory inside the 30 km zone closed to people would be tackled within the next five years.

But what about the radiation danger to people outside the "death zone ?" Dr. Velikhov called for "avoiding exaggerations and unverified information." And he cited an example about himself; "The 40 or 50 roentgens which we professionals usually get are quite a normal dose, which does not pose any threat to my organism in my view."

> A very typical comment! While nucleocrats dismiss claims that any particular case of cancer could have been due to radiation, they do at the same time offer absence of discernable health effects in a particular case as 'proof that radiation at that level is 'harmless' to all.

The programme adopted by the USSR Supreme Soviet envisages an improvement of medical care and the improvement of the environment in polluted territories, the registering of all who lived or worked in the danger zones, the creation of a "Children of Chernobyl" programme, and the drafting of a special law on the Chernobyl catastrophe.

Sixteen billion roubles have been year marked for the implementation of the programme, which is equal to the annual surplus of the country's national income. This was announced by the Prime Minister Nikolai Ryzkhov, though he added that this money had yet to be earned.

CHERNOBYL SARCOPHAGUS IN DANGER

Seismic activity has recently boen recorded in the vicinity of the Chernobyl nuclear power station, causing Soviet decommissioning experts to fear that the sarcophagus covering the unit could crack, allowing further releases of radioactive materials.

According to the documents obtained by *Nucleonics Week*, Soviet officials notified German Ministry of Environment and Nuclear Safety (BMU) that tremors had recently been recorded in the vicinity of the reactor and the sharply inclined roof of the reactor could shift despite remedial measures taken to keep it in place. They also said that the concrete walls of the sarcophagus and the reactor floor are unstable and could collapse.

German documents state that if the sarcophagus were to open, the volume of radionuclides released as dust from the reactor could be nearly twice the inventory by percent released during the 1986 accident. Following that accident only about 5% of the total radioactive inventory was released to the outside whoreas nearly 95% was retained within the reactor. German experts fear that is the sarcophagus collapses, the remaining radiomondes would be thrust outward by heat and air currents further contaminating the surroundings.

Because of the seismic activity, The Seviots are now backing away from their original Plan to build a second sarcophagus to cover the first. because it, too, would be vulnerable to tremous Instead, they now favour dismantling the reactor and decommissioning the site, decontaminating it to the "green-field" level. Western experts view this as impractical. According to Enno Hicken, a senior reactor safety expert at the Juelich Reserach Centre (KFA), the difficulties of dismantling smallo reactors without the additional problems associated with a severe accident, were "already considerable."' And unlike Three Mile Island Unit-2, he said, the fuel and fissile material inside Chernobyl-4 is widely distributed. The thermal and radiological conditions inside the core at present would prove too much for even state-of-the-art robotic equipment. Because of the great volume of contaminated dust inside the sarcophagus, Hicken doubts that the site could be decontaminated without the construction of a second sarcophagus to contain the dust for several decades, regardless of the threat to such a structure posed by earthquakes.

Besides the danger posed by earthquakes, there are other problems as well. One danger is that the fuel that is left in the reactor core could become critical if it was moved around or became compacted. Since the enrichment level of the fuel is only 2% U-235, the chances of recriticality are "slight." However, this analysis fails to take into consideration the chances that the sarcophagus could collapse.

Additional problems include one raised by a former senior Chernobyl engineer who was elected to the Ukrainian parliament in March. In an interview in July, he told the daily *Sueddeutsche*

Zeitung that a 1,000 square metre area of the sarcophagus had been softened up by neutron bombardment. According to experts, present emission levels measured outside the sarcophagus are 40 billion Becquerels per day which is incidentally five times the daily limit allowed for German reactors. The radiation which is escaping the sarcophagus from a number of leaking points, is carried out by strong convection currents generated by the high heat inside the reactor building. The temperature inside the sarcophagus has been measured in some places to be as high as 200*C. Western experts say that the large amounts of boron carbide and sand dumped into the reactor to extinguish the fire in 1986, may now be inhibiting decay heat dissipation now.

Sources :
Sputink : Digest of Soviet Press, September, 1990
WISE News Communique : *340, October 19,* 1990

New Clear Technology - Murky as Ever !

Nucleocrats are a hardy breed. They would like the public to think that nuclear industry is not dying at the hands of the marketplace. Hence, lately they have begun to argue that a combination of concerns about the greenhouse effect and the new "inherently safe" technology will revive the nuclear power industry. Forbes — a business magazine from USA — (which had once written an article highly critical of the nuclear industry and has never fail, d to pat itself on the back for it) now says in an article entitled "The Greenest Form of Power"

> *"Nuclear power is not dead. It is just sleeping. Solar power and wind power and the like are pie-in-the-sky, clean safe nuclear power is a reality. "*

Richard K Lester, a professor of nuclear engineering at MIT, in a similar vein :

> *"Second generation nuclear technologies would reestablish nuclear power as a major source of electricity."*

While according to the President of American Nuclear Energy Council :

> *"Nuclear energy must be revitablised in order to alleviate the greenhouse effect."*

A politician who has clearly been seduced by these new non-existent reactors is the Australian opposition spokesperson on energy, Senator Peter McGauran. In a confidential June 1989 memo he says :

> *"You would know that new generation reactors which maximum safety features are now coming into use. They are small (250-400 MW) and fully automated, and overcome the many safety problems associated with large-scale reactors of the past*[4]*

Senator McGauran has jumped the gun here : not one of the advanced reactor concepts he mentions has actually boon built. Nothing more constructive than design studies have been done. In the same document he rhapsodizes that :

> *"Recent reactor designs are particularly impressive. They are easily operated, and have phenomenal safety advantages.*[44]

In a way, Peter is right : everyone would agree that non-existent nuclear reactors do have phenomenal safety advantagos.

So is new technology really the answer to nuclear industry's prayers or is it just the proverbial grasping at strws. Unitl now the dominant nuclear technology has been PWR and the BWR, with a few doddery magnox and AGR in UK, a few surprisingly good CANDU performers in Canada, South Korea and Argentina, and unspeakable RBMKs in the Soviet Union.

> An editorial aside :
> While the CANDUs have been good performers elsewhere, there performance in India has been uniformly awful. Also it is interesting to note that while abroad nuclear propagandists are extolling new (as yet on the drawing board) technology whereas in India the Nuclear Power Corporation has been taking out advertisements staunchly proclaiming the invincibility of the present generation of reactors.

These 'old technologies', it is argued, are too big (1000 - 1200 MW) and too costly ($2-4 billion) to fit easily into third world electricity grids or US utility budgets or planning horizons. They rely on complicated, active, 'add-on' safety systems that cannot be relied upon and cost a lot of money. They take a long time to build; partly because of their sheer scale, partly because of the regulatory problems that arise (mainly US, but also West Germany, and even in the UK), because each reactor is 'custom designed' and different; and thus has to have its entire design verified by safety authorities; and partly because engineering giants such as Betchel in the US have a way of doing things like putting in 1400 electrical circuits back-to-front, like they did at the Midland plant before it was abandoned. Finally, the PWR and BWR designs are conceded to contain real inherent safety problems — at least by engineers who are proffering alternative designs. Those who argue for 'now generation' nucler technology in this way concede much of the safety case nuclear critics have put up for years.

But, we are told, the answer is not to opt for low energy, conservation-oriented society. Technology forbid! Clearly the answer must be new technology. And so a new generation of reactor technology is on the drawing board whose characteristics are supposed to be :

Relatively small size (150-400 MW)

Modularity: Rather than say 1,000 MW units, reactors will come in, say, 600 MW 'clusters' of 4 x 150 MW, or in lines of identical units of upto 400 MW.

Standardization : No more custom built monster power plants. Instead, identical units of much smaller size are to be factory made on an assembly line.

Reliance on 'passive' safety features : new reactor designs are to rely on gravity and natural circulation to get rid of heat, not an 'active' features such as pumps.

'Automatic' shutdown : In designs such as PIUS, borated water is supposed to flood the core and shut the reactor down if anything goes wrong without the use of pumps.

'Forgiving' operating characteristics : If something does go horribly wrong, you don't have just 30 seconds like at Three Mile island, to flood the core before the fuel starts to melt, or just about 3 seconds as at Chernobyl, for an emergency forced shutdown before the reactor goes prompt citical and blows up. You are supposed to be able to walk away from designs like PIUS and MHTGR for days on end before anything actually needs doing — or atleast, that's the ideal.

Apart from the still insoluble waste problem, and besides being the most costly way of cutting the greenhouso emissions, what else could possibly be wrong with these lovely new technologies ? Let us look at them one by one.

High Temperature Gas-Cooled Reactors (HTGR)

The HTGR is or was my favourite nuclear reactor. Unlike the PWR, BWR or CANDU, the HTGR doesn't have a lot of water inside a breakable pressure vessel, trying to keep the fuel from melting. Instead, it has a much bigger graphite core cooled by circulating helium gas at a relatively low pressure, but with a much higher temperature than the present generation or reactors. Thus, it is able to heat water inside its steam generators to high (and much more efficient) temperatures typical of fozzil fuel generating stations.

Actually HTGRs are not all that now. They are the descendants of the old English Magnox and AGR plants whose performance to date has been uniformly awful. USA's 300 MW prototype HTGR at Fort St Vrain was recently shut down because of embarrassingly bad performance. The West German THTR, a unique 'pebble bed' reactor, was shut down before it had even boon properly commissioned because after relatively minor problems with fuel damage and snapped bolts in its gas duct, it was felt by its operators to be a financial meltdown in the making.

With a lineage like that, why the optimism about HTGR and MHTGR (Modular HTGR)? Well, it seems that General Atomics - the people who gave the world Fort St Vrain - have now teemed up with Siemens and HTR-GmbH of West Gormany to built a small (80 MW) MHTGR prototype inthe USSR at Dimitrovgrad. And in the meanwhile General Atomic's MHTGR concept has been selected by the US Department of Energy (DOE) for one of the two now plutonium production reactors for military uses. DOE has also increased its funding for civilian MHTGR technology.

But all is not smooth sailing for MHTGR. For one thing, the company isn't happy that DOE wants it to put a containment on the reactor. They are 'inherently safe' you see, and therefore, the company contends there is no need for a costly containment building. The company also feels that DOE's insistence on a containment would set the wrong precedence for civilian MHTGR reactors.

Yet, according to Advisory Committee on Reactor Safeguards, a fire in the HTGR's graphite moderator could happen if the reactor vessel or the core support system failed, resulting in "severe consequences".

The HTGR will need a lot of governmental help. A prototype HTGR is estimated to cost $ 1.8 - $2.1 billion for 400 MW capacity — no cheaper than the financially disasterous present generation of reactors. The claim is that if prototype costs are met through government subsidy, subsequent reactors would be cheaper. Robert Pollard of the Union of Concerned Scientists says "The nuclear industry should join the free enterprise system."

The time horizons being talked about by DOE are interesting as they indicate that the MHTGR, though the most 'advanced' amongst the now reactor concepts, is still very far from being a reality. A feasbility study for a 4 reactor, 500 MW civilian plant was nearing completion in March 1990 *[Nuclear* Engineering *International* March, '90). The study was done in part "to determine what government support would be necessary" to build a lead - plant "after the turn of the century." DOE itself is saying that MHTGR designs should be certified "early in the next century." This means that their construction won't even start till past 2000 - 2005 and that means that there won't be any MHTGR in the US till 2010.

Process Inherent Ultimate Safety (PIUS)

Meanwhile ABB-ATOM of Sweden and United Engineers of US have teamed up to market the PIUS design in the US. (Nuclear Engineering Internationa], August, 1989)

The PIUS design originated in Sweden, and envisages the entire reactor core being submerged in borated water, which normally prevents a nuclear reaction of any kind. Any minor deviation from normal operation allows the borated water to enter into the core and stops the reaction. The only problem is that the whole design concept has never been tested : no one has actually built a PIUS of any size, not even a 5 - 10 MW, so there is absolutely no guarantee that the thing would work at all.

PIUS is also in fact, not toally immune to catastrophe. It is possible for **the** vessel containing the core to rupture. Also it seems likely to he very costly.

Other Designs

Besides PIUS and MHTGR there are a bewildering multitude of 'inherently safe' designs floating around. DOE favours a liquid metal cooled reactor called PRISM, which doesn't seem to be inherently safe at all! It depends on liquid sodium for heat transfer - with all the potential for fireworks that implies. There is a chance that if the sodium coolant were lost the reactor would blow itself apart. About the only real safety advantage of PRISM seems to be that it takes a while to heat up if circulation pumps fail. PRISM like MHTGR is supposed to come in nice bit-size 135 - 150 MW x 4 bundles.

Other 'new' reactor concepts are GE's SBWR, a sort of simplified BWR. It is very similar to ABWR (Advanced BWR). GE is developing this in partnership with Toshiba and Hitachi of Japan. ABWR does seem to have a good chance of actually being built, but it is hardly a 'new' technology — rather it is the development of existing BWR design. With the continuing slowing down of Japanese reactor construction programme, it is unlikely that more than one ABWR will be built.

Another Japanese design is the 'System Integrated PWR' (SIPWR), a unique PWR with the troublesome steam generators inside the reactor vessel. Given the trouble there has been with steam generator leakage and replacement, this doesn't seem to be such a good idea: when the SIPWR has steam-generator problems they have to replace the entire reactor. Needless to say that no one has built or ordered one yet. (NEI, November, 1909)

It is interesting that at a recent IAEA forum, thee were some speakors who criticized the new technologies. Former US AEC Chief, James Schlesinger said that while the new technologies would probably be developed, there was no guarantee that they would ever be employed *{NE1* Nov. 1989) Schlesinger favoured 'evolutionary' design such as ABWR or SIPWR which he felt might be ready by the 1990s.

Others in the nuclear industry have also suggested caution over the now design. At a conference in Madrid, the chairman of the European Nuclear Society, Hans - Honning Honnies, said that what would influence the public wasn't exotic new design but a proven safety record, and in order for ' current levels' of performance (!) to be achieved, about thirty years of operating experience would be needed. But these speakers while denouncing new nuclear technology wore quick to minimize **the problems faced** by **the current generation of** nuclear reactors !

The upshot of all this is **that 'new generation'** nuclear technology is being marketed with the same unjustfiable techno-optimism and hype as was the old technology, and with even less justification.

Some of the new 'inherently safe' technologies such as PRISM seem to be as inherently unsafe as their FBR cousins, but use the excuse of claimed inherent safety to dispense with containments. Others like PIUS or MHTGR, might have been **a** good idea if they'd have had prototypes deployed some twenty years back, so we could now build a few standardized designs based on solid operating experience - if we weren't sensible enough to opt for energy efficiency instead. As it is if governments foolishly make a substantial commitment to one of these technologies now, they would have the first operating prototypes by say 2010 - 2020. The greenhouse problem by then would have become a whole lot worse, not in the least because money spent on costly nuclear power would save 7-10 times loss C02 than if it had been spent on energy efficiency. *

Inherent safety is the functional equivalent of too cheap to meter.'

Inherent safely is the functional equivalent of too cheap to meter.'

Back to **the** Real **World**

Meanwhile the nuclear power industry keeps slowoing down - the number of reactors under construction continues to drop. According to the industry publication Nuclear Engineering International there wore 109 plants under construction worldwide in December, 1988. By December, 1989, the number had dropped to just 97. Since then more plants in the USSR have been cancelled. According to latest US estimates only four reactors with definite operating dates are still under construction in the US, with nothing not subequently cancelled has been ordered since 1973.

Nuclear programmes in the two great 'successes' of nuclear power, France and Japan too are slowing down. Nuclear ordering in France is on the verge of a complete halt. UK's ambitious PWR programme has been completely scrapped, with construction proceeding only at Sizewell-B.

A recent Greenpease report estimates that world's nuclear capacity would peak in 1995-96 and would be on the way down by the beginning of the new century.

John Hallam
Chain Reaction
Friends of the Earth,
Sydney, Australia

Testimony

Stoke the furnace, gramma used to tell my daddy-
he'd roll up his sleeves, obediently, and shovel in more lumps of coal;
i watched the fire from the basement steps; innocent, mesmerized
by the crimson flames crackling behind the window into hell;
only my young heart, thump-thumping, recognized the danger.

One day, the coal man came-menacing, dirty man; delivering clouds of dust;
quick, run upstairs into the attic, climb into gramma's trunk from the old country;
ah, just enough to hide a wee one.

i read it in the newspaper:
"hanford....forty years ago....twenty thousand boys and girls, especially babies....
higher doses of radiation than any incident since the dawn of the nuclear ago.
....secrecy maintained....till now...."

Murky clouds choke out the sunlight; how could they do this to me?
like an abusive parent hiding behind the facade of a respectable home,
the government counts the children among their possessions;

Illusions about government's parental role vanish, but couldn't they say they're sorry?
don't you understand? i wasn't for sale!
not to anyone; not for any reason; most certainly not as a guinea pig!

Rage-shouting, kicked in the gut, "i could kill" rage! who the hell is responsible?
i feel like a blob of raw meat, vulnerable beyond my wildest nightmare;
the fire is seething, rumbling, multiplying like molecules of yeast;

Life is suddenly more precious, more precarious, too;
shall i hide? or go onward into the flames?
what is that noise? my soul, pleading; i'm afraid they'll find me wherever i go.

Remember pogo, a little voice whispers-i've seen the enemy and they is us;
yes pogo, and they is me, too.
you will take care of things, won't you?
creditors are breathing down our neck; we leave on vacation next week;
we have other plans; we're too busy; we don't feel well, maybe later.

Oh, we do some church work; toss some coins in the kettle, even helped a neighbour last week;
attention everyone, please appreciate our generosity;
how righteous we are!

We have fueled the fire with our silence; words unsaid and deeds undone reduced to ashes?
have i been a victim? yes, but so have you!
shall we-you and i-continue to feed the furnace?

Or is it time to gather up the shattered shards from dying coals? is there enough time
to forge a discerning sword? are we willing to risk living love with a thinking heart?
i must-or the flames will consume me.
Arlene Hetherington

Arlene *Hetherington grew* up in Spokone, *Washington. She was nine years* old *at the time of the* deliberate *Radioactive releases from the US* Government's *Hanford* nuclear reprocessing plant *known-as the Green* Run Experiment in 1949. When *she was in* her *thirties, she developed large tumours* on *her thyroid* gland *that* threatened to obstruct her *windpipe. This led to several* surgeries. *When physicians removed the* tumours, *they were found to* contain pre-concerous cells. She now *lives* on Bainbridge Island *and is employed as* a tourism planning *consultant.*
Source: HEAL PERSPECTIVE Vol. 1 No. 3. fall 1990.

REVIEWREVIEW

Earth Rising

David Oats
Oregon University Press 1989

Earth Rising
David Oats
Oregon University Press 1989

The farmer in India considers listenning' the most important way of learning agriculture. For generations the advice that is handed out is "Go early in the morning to the farm. Go around the entire field and visit each and every plant. It will tell you what to do!" The field, the soil, the crop, the birds, the insects, the water and even the early morning rays of the Sun speak to the farmer. This closeness, in fact, identification with every living and non-living being is considered as the obvious way of a farmer's life.

This oneness with 'life' - an understanding though both obvious and simple is yet to dawn on the modern man'! The SCIENTIFIC man! David Oats is like an early bird announcing the coming - "EARTH RISING". Incidentally, the cover of the book is a beautiful photograph taken from the moon by the members of the original moon landing mission.

"Nowhere in the Solar system is the contrast between a dead and a living planet so conspicuous as on the Moon with Earth Rising'*

"Nowhere in the Solar system is the contrast between a dead and a living planet so conspicuous as on the Moon with Earth Rising"

The book is a manifestation of a vision. The vision for homo sapiens to mature and belong to 'Gaja' - the super organism. 'Gaja' hypothesis as proposed by James Lovelock, suggests that Earth's atmosphere and the oceans are maintained as highly sophisticated buffering devices by the totality of life on the planet. The whole Earth, in other words, functions as a single organism - Gaia. Gaia was the name given to the Earth Godess by the ancient Greeks.

> *Humans! I Mountain am speaking. You cannot ignore met I have been with you since your very beginnings and long before. For millenna your ancestors venerated my holy places, found wisdom in my heights, I gave you shelter and far vision. Now, in return, you ravage me. You dig and gouge for the jewel in the stone, tor the ore in my veins. Stripping my forests you take away my capacity to hold water and release it slowly. See the silted rivers? See the floods? Can't you see? In destroying me you destroy yourselves. For Gala's sake, wake up!*
>
> *Pat Flemming and Joana Macy:*
> *Thinking like a* Mountain

The author does not run down science or 'progress' as such. The scientists are maintaining empirical rigour and skeptical inquiry: the farmers are trying to wrestle with the whole fact of existence, to bring coherence out of it. Real *people need both approaches.*

"The essential gesture of ecologism is an act of deference to the natural world: one adopts an atitude of seeking or listening rather than imposing ...."

Especially potent is the principle of ecological balance, derived from the vision of a stable ecosystem. Recycling cans, bottles, paper, whatever is a ready example, trivial though it may appear on the surface Behind this practice lios the notion that our cultural habits of consumption and waste ought to be replaced by the habit of gaining the most out of raw materials by using and reusing thorn frugally to ensure enough for tomorrow and for tomorrow's tomorrow. Ecological thinking stresses that human society ought to find a balance between input and output so that nothing essential ever truly runs out.

"Skills unpreventably give pride and confidence. They won't build your character necessarily, but they will unable a breadth of experience where character might clarify. A wealth of skills docs not ensure freedom any more than any other wealth, but it surely can expand choice, which may lead out of some corners. As for wisdom, that's the name for the sustained habit of paying attention, of learning larger by learning longer."
Stewart Brand

Formula for an interesting life: Acquire skills and use them. The more skills, the more interesting the life.

From seeking this balance, understanding it, we go through Cooperation, Cybernetics, The Natural Mind and Ecological Ethics. The chapters unfolding in a manner that can be termed 'natural' - unfolding ideas like a bud; opening the leaves slowly, silently, positively and refreshingly fresh!

Hence the reader enjoys the spectacle of nature while reaching for wisdom!

Walter R. Canon in his The *Wisdom of the Body* (1932) provided an early glimpse of the deep inter-connectedness of different kinds of biological systems. The book is about the human organisms ability to regulate its internal state; keep its temperature, fluid levels and concentrations and the like within acceptable limits. Canon's term for this process was *homeostasis* - the means employed by more highly evolved animals for preserving uniform and stable their internal economy... He applied homeostasis to other biological systems and carried this process right up the scale from single cells to human civilizationa. *"Just as in the body physiologic, so in the body* politic, *the whole and its parts* are mutually dependent; *the welfare of the large community and the welfare of the individual* members *are reciprocal............*"

David Oates discusses Bill Devall and George Session's 1985 book 'Deep Ecology - Living as if Nature Mattered'. The book follows the insights provided by the philosopher Arne Ness.

"Ecology as a science does not ask what kind of society would be the best for maintaining a particular ecosystem - that is considered a question for value theory, for politics, for ethics. As long as ecologists keep narrowly to their science they do not ask such questions. What we need today is a tremendous expansion of ecological thinking into what I would term 'ecosophy'... a shift from science to wisdom." In the author's view, 'Deep Ecology' "Is trying to exclude a large part of the ecological movement from full membership." The suthor rightly stresses the need for inclusion of all efforts also contradictions.

The author feels that the ecological world-view has found its way through the eightees with surprising vigour. His assertion that, "It seems certain that the physical realities of the earth, as well as the psychological and spiritual needs of its human inhabitants will guarantee an interesting creative future for the world view of ecology." is a view with which we cannot but agree.

"The meaning of life to Faustian man, is will and victory. The meaning of life to the ecologically wise, is *life itself,* over which "victory" is a meaningless concept. Wisdom takes satisfaction in understanding the limits of power, how to avoid hurtful exertion within a naturally balanced whole. Knowledge is very strong, and is in many places around us transforming the world for the worse. Only character can remake and control this knowledge; only the wisdom of the centered, balanced person, who knows that life and mind are part of the earth itself."

Copernican view shifted the world from the centre of the universe; the ecological view attempts to shift humans from the centre of all life on earth. For all of us who are looking for "life" this book has covered the major grounds so far. This is an important book, if not the book to gain an insight into the ecological world view.

Jyotibhai Desai
Vedchhi

EMERGENCY PLANNING

IN CASE OF NUCLEAR ACCIDENT
TECHNICAL ASPECTS
Proceedings of a Joint NEA/CEC Workshop
OECD Paris 1989

EMERGENCY PLANNING

IN CASE OF NUCLEAR ACCIDENT
TECHNICAL ASPECTS
Proceedings of a Joint NEA/CEC Workshop

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The Nuclear Energy Agency (NEA) was established in 1958 with the aim of furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source. The agency organises workshops and seminars at which participants can exchange tochnical information and harmonise national regulatory practices.

Emergency Planning in Case *of* Nuclear Accident is a collection of papers presented at a workshop held in Brussels on 27th - 29th June, 1989. It thus represents some of the latest (post Chernobyl) thinking on the subject in the rich countries of the world. This book is an important contribution and deserves to be resd especially by public authorities who have boon entrusted the task of ensuring public safety during nuclear emergencies. It is divided into four sections besides the overview. The topics dealt include the basis for emergency planning, surveillance and monitoring, experiences from chomical emergencies and from conducted exorcises.

The major shortcoming of the book is the fact that it is written in oficiallese. Perhaps that cannot be helped since it is a collection of documents written by officials and for officials. Nonetheless it does make reading the book a chore. However, a diligent study does bring forth some useful nuggets of information. For example : there are separate considerations that need to be taken into account while doing emergency planning. In the zone immediately next to the nuclear facility the main considerations are protective measures like evacuation, sheltering, thyroid blocking that are of primary importance while in the regions some distance away one needs to plan basically with a view to control foodstuff and water. USA has the largest emergency planning zones of any country. The primary zone there extends up to a radius of 16 km from the plant site while the secondary zone extends upto 80 km. Contrast this with India where the primary zone is just 8 km. and the secondary zone just 16 km from the plant site. But contrast both with what happened at Charnobyl. There, people within a radius of 30 km had to be immediately evacuated while hot spots (regions with abnormally high radioactive contamination whose agricultural produce is unfit for consumption) were found hundreds of kilometres away. Thus, one finds that contrary to oft stated assertions, the lessons of Charnobyl have still not been learnt anywhere in the world. Nucleocrats are yet placing unbounded faith on that totally discredited axiom : "Nuclear disasters are extremely rare events and more severe the accident the less its likelihood of occurance."

Similarly, it is interesting to note that intrvention levels (guidelines to decide appropriate protective measures) vary from country to country. While in Germany, sheltering is advised for a dose of 5 m Sv and is mandatory above 50 mSv, in the UK it is advised at just 3 mSv and becomes mandatory at 30 mSv. For comparision, in India, sheltering won't be resorted to till an exxternal dose of 10 mSv is reached though it is mandatory at or above 50 mSv.

Priced at 220 French Francs for the paperback edition the book, is way beyond most Indian pockets. But it may be a good buy for libraries and documentation centers. Needless to add that it is extremely well produced in terms of printing binding and get-up.

EXCERPT

Now accident analyses represent substantial advancement in many areas. Perhaps the most important conclusion is that large early releases given a core melt accident still seem possible. Thus, provisions must be made for coping with such releases, so the scope of emergency preparedness cannot be reduced at this time.

A second very important conclusion is that the time and the magnitudes of releases cannot be predicted by the operators with confidence in real time. After over 20 years of study, there remains considerable uncertainty and controversy amongst experts regarding the timing and magnitude of source terms.

Source term :
Radioactive release during *an accident*

There is important positive information. First, there should be at least two hours warning before a major release, so early emergency response could prevent fatalities regardless of source term. The new analysis describes core melt accident as unmistakable by the time core damage starts. With the cooling provided by natural circulation, melt-through and a substantial radioactive release to the environment should be at least two hours away. This time can be used effectively by poople if they are provided early warning.

Secondly, early evacuations even within only two to three miles of a plant can substantially reduce the conditional risk of early fatality and injury, regardless of the source term.

This is consistent with other reports in the US that risks do reduce markedly during the first two to three miles and then slowly thereafter. Fortunately, much more time would be available for radiological monitoring teams to identify hot spots beyond this distance - where relocation from shelters might be prudent or necessary.

The overall implications of these new studies for emergency preparedness are :

Don't delay an evaluation within two to three miles if a core melt accident is indicatod.

Monitor for hot spots as soon as possible after a release.

It is important to remember that core melt accidents are not expected. Thus a protective action scheme based on initiating early precautionary evacuations for a core melt sequence but not otherwise, would accomplish as several things simultaneously :

Planned evacuations should be vrry rare, since they are warranted only by core molt accidents.

Prudent, precautionary evacuation would be initiated early, for cause.

Early evacuation within two to three miles considerably reduces risks (by a factor of ten or more).

Hot spots beyond two to three miles can be readily identified after a release and relocation from them can be accomplished in a more leisurely manner to accomplish dose saving objective.

EXPLOSION AT SOVIET FUEL FABRICATION PLANT

The official Soviet news agency Tass has reported that an explosion took place on 12 September '90 at the Soviet fuel fabrication plant in Ust-Kamenogorsk in Kezakhstan, a city with a population of a half million, located near the border of the USSR, Mongolia, and China. According to Tass, no fatalities occurred, but many people are said to be injured. Panic broke out and many left the city.

Tass stated that the explosion occurred in an underground beryllium production facility, Ulbinsky metallurgical works, causing a fire which resulted in a gas cloud that moved out over the area. The toxic gas containing beryllium hung over residential districts for most of the day before being dispersed by the wind. Days later the streets and houses were still being hosed down to keep poisoned dust from flying into the atmosphere.

The area has been declared an ecological disaster zone. Separate reports say, however, that a medical team from Moscow has determined that there is no risk of substantial health effects on the local population (where have we heard that before!), although some areas are contaminared with beryllium at 60 times the allowed level. It has also been stated that the facility will be closed though no date was given.
Source:
WISE *NEWS COMMUNIQUE 339 340.*

LETTER BOX

To sin by silence makes cowards of men. Let them who dare, speak and speak again to right the wrong of the atomic lies."

This is in reference to your editorial in Vol. 4 No. 1 regarding the unjust dismissal of Prof. R.G.V. Menon. I have closely watched the operations of Atomic Energy Commission since the days of Dr. Bhabha. Throughout, it has been a performance characterised by lies and lies only and the people have had to pay the price for nucleocrats' folly.
Prof. V.L. Talekar
C-169, Bajaj Nagar,
Jaipur 302015

I have been reading every bit of Anumukti since December 1989. In the June/July '90 issue there was a very good story under the title "Dirty Tricks of Decent Men" on renewable energy sources written probably in response to Dr. M.R. Srinivasan's published observations regarding renewable energy sources.

Till recently the Department of Non-conventional Energy Sources (DNES) was headed by Dr. M. Dayal, who used to be chief superintendent of Tarapur Atomic Power Station a long time ago. Now, after retirement from DNES he has returned to Department of Atomic Energy and is now posted in Nuclear Power Corporation's Delhi office as a Senior Technical Advisor. The overall prospects for renewable energy sources in India are just as bleak as those for atomic energy.

During the coming decade, say even by 2010 neither atomic energy nor new/renewable energy sources will contribute much to the country's requirements. Fossil fuels like coal, oil/gas and hydro will continue to dominate the energy scene.

Truly speaking scientific temper has not yet developed in the country. We only do our accounting in terms of per capita electric power consumption. We are least bothered about the proper and judicious utilisation of the abundant natural and human resourced available in the country. The politicians, bureaucrats and technocrats have developed a nexus among themselves to propagate and promote their vested interest at the cost of the poor. They have invented very treacherous and tricky terminology like "socialistic pattern of society", "poverty removal programme", "Jawahar Rojgar Yojana", and the very recent "Mandal Commission".

While energy conservation has become the foremost agenda for advanced countries, this is the least talked about item among both government as well as voluntary agencies in this Country. Electricity generation industry in India has a huge potential to improve capacity and availability factors. Just the leveling of peak demand would Yield at least 15 to 20 percent. The transmission losses in India are the highest in the world. Thus, there is ample scope for improvement. But neither the pofttticians, nor the bureaucrat or the technocrat have bothered to do anything in this direction. In every sector of our economy, the picture is the same whether it be chemical industry, transport or agriculture. There is everywhere misutilisation. Either there is underutllisation or there is over-utilisation. For examples of the latter just think of suburban trains or buses in Bihar or the trams of Calcutta. We are living in poverty as well as plenty.
Dr. *G.G. Prasad*
7-C Kedarnath,
Anushakti Nagar,
Bombay 400094.

I am writing this letter on behalf of our small group NILA which is working on environmental awareness. At present we are campaigning against the proposed nuclear power plant in Kerala. On October 2nd we will be organising a protest march at Kottayam in which prominent public personalities like V.R. Krishna Iyer and Sugatha Kumari are expected to join with us.

I read "Chernobhata?" in Third World Network Features No. 486. I would like to have more information regarding issues related to nuclear energy. If you could send us some materila, that would be a great help in writing about the issue in Malayalam. We will be translating "Chernobhata" and publishing it in Kerala shortly.

Since we are here in a small village, gathering information is not easy. So please help us. Also send a note about the materials available with you, so that one of us might come to Vedchhi to refer to it.
Abey George
Ayamkudy, P.O. Muttuchiro
Kottayam, Kerala 686613

Editor's Note :

Over the years we have collected an enormous quantity of material regarding various facets of the nuclear issues. Also, since we too live in a small village, xeroxing the material is not easy and entails a long trip. We do try to send copies of material with respect to some specific requests. However, Abey George's idea of someone coming to Vedchhi to sort through these piles is most welcome. All are welcome to come anytime and research the material.

DISQUIETING ADVERTISEMENT

A recent advertisement by the Nuclear Power Corporation features glass of milk and some vegetables in an attempt to convey that a nuclear reactor is just as harmless. As irrefutable proof it gives radiation levels in terms of milllrems from different natural sources and compares it with the expected level of emission from a reactor. But the trouble with the radiation estimate is that it represents the ideal, even wishful figures as if already achieved nay as if they wore the basic characteristic of the plant. This way, what is inherently unsafe is made acceptable.

The true story of nuclear programme everywhere is heavily stained with accidents and leaks and an aggresive cover-up of it by the state run agencies. While the mighty explosion at CIOrnobyl was sufficient to seal the fate of nuclear power in most countries, we in India are still planning a ten-fold increase.

The very beginning of the nuclear cycle, the process of mining and refining radioactive materials, is one of indifference to health of workers and the local population. A few years back, V.T. Padmanabhan published his findings of the hazards created by the Indian Rare Earths Plant at Alwaye, Kerala which established beyond doubt that the people working in the plant had a far higher incidence of radiation related diseases than those working in other industries in the region. The Times *of India* in its main editorial had called this "Disquieting News".

Even in industrially advanced countries independent research on the health of workers in nuclear plants and on people living in its vicinity has confirmed that the claims being made by nucleocrats are an eyewash. At Sollafield nuclear reprocessing plant in the UK, it was found that the levels of leukemia and non-Hodgkin's lymphoma were ten times as higher than expected for local children.

An advertisement that equates the harmful effects of a nuclear plant with a glass of milk and vegetables sounds a gruesome joke.

Kersi *Sabavala*
Mohite BIdg. near *Amardeep Apt. Baroda 390001*

Editor's Note :

No, the trick Is not in presenting ideal figures as actuals though there is that of course. The real trick lies in averaging. Consider any nuclear plant however badly run, say Chernobyl for example. The average dose to the people of the world from Chernobyl has been less than the natural background since most people in the world do not live near Chernobyl. Even the number of fatal cancers produced by the Chernobyl disaster, though it may eventually be well over a million, is negligible in comparison to the 'natural' occurence of cancer in the world. Thus, by averaging over a large enough area any polution can be shown to be much less than the 'natural'. The trouble is that there are a large number of people who receive a dose which is much larger than the average.

NUCLEAR NOTES

SOVIET N-PLANT SINKING? The Kalinin nuclear power station, 100 km north of Moscow, could sink into the ground at any time, resulting in another Chernobyl. According to Nikolai Gladkov, chief hydro-geologist with the Kalinin Geological Survey, the station is built on karst limestone which is full of hollows and crevices. To make matters worse, the two new units now being built will need subterranean waters for cooling. Gladkov warns that pumping water could cause a "sudden catastrophic" subsidence.
-*WISE NEWS COMMUNIQUE* 340.

Subscription Rates :

Rs. 25/- *per year South Asia*
U.S. $ 15/' per year air mail overseas
(Rs. 200/- *per year if paid for in India)*
Lifetime Rs. 250/- *(only within India)*
P Editor Anumukti
D Sampoorna Kranti Vidyalaya
c
Vedchhi, Dist.: Surat, 394641 INDIA

Editor : Surendra Gadekar
Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

Published by S. Gadekar for Sampoorna Kranti Vidyalaya and printed by him at Parijat Printery, Ahmedabad, typeset by Parijat Shah & Associates, Ahmedabad.

Anumukti staff regrets the late publication of this issue. All sorts of causes, from Diwali to riots to computer viruses conspired to bring about this unwelcome outcome. We hope to bring out the next issue by the 15th of December.

PRINTED MATTER
BOOK POST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 3 **December 1990 / January 1991**

धर्मक्षेत्रे चान्दपुरक्षेत्रे समवेता युयुत्सवः . . .

Today Mahabharat is being fought once again. I don't mean the carnage in the Gulf. That is modern warfare— totally bereft of morality, purpose and meaning—a war to test the war machine.

The setting of Mahabharat is the border of Gujarat and Madhya Pradesh at a place called Ferkuva in Gujarat and Chandpur in M.P. On one side is a large band of about to be dispossessed people, whose battle cry is *"Koi Nahi Hatega — Bandh Nahi Banega."* They are willing to die, but are not willing to be made into sacrificial goats. On the other side supposedly is an even larger army - people involved in a 'Mahayagna' to a Goddess called 'Development' whose battle cry is *"Jeevadon"* (Sardar Sarovar Dam is Gujarat's lifeline.)

For me the analogy with Mahabharat was brought into sharp focus because I saw Chunibhai Vaidya In the camp at Chandpur. Chunibhai to me, has been for nearly two decades now, a great hero. During the dark days of emergency, when many a stalwart in the press had decided that silence was indeed golden, Chunibhai's voice in the *Bhoomiputra* was a stilting call to freedom. Despite persistent persecution by the government he had remained unbowed and defiant. Today however he had come as one of the leaders of the pro-dam agitation having being sent by the Chief Minister of Gujarat to parley with the leaders of the anti-dam agitation.

The position of the pro-dam rallyists can be briefly summarized thus:

- The entire people of Gujarat support the construction of the dam.
- The decision to build the dam was taken after much deliberation lasting many years. Now, nobody, howsoever eminent and respected, has any right to reopen the issue. A delay of even a single day means a huge expense (Rs. 4 Crores) to the public exchequer in Gujarat.
- While they are willing to talk to the leaders of the anti-dam agitation on issues such as resettlement and deforestation, the question of the government reviewing the project as a whole or of stopping work on the project while such a review was in progress, just did not arise.

The saner elements amongst them (a small minority) also felt that:

- Confrontation between the people of Gujarat and the people of M.P. should be avoided and agreement should be reached through negotiations alone.

Each of the first three points is debatable to say the least. Public support to issues varies with time as the amount of information available to the public changes. Governments are prone to present only one (very rosy) side of the picture while commissioning a project. They are also liable to resort to ambiguity and misinformation so that by the time the project affected people come to realize what is to be their impending fate, it is already too late and the issue has been well and truly settled. In the not too distant past almost everybody including myself thought that nuclear energy was a boon. It is only as more and more information has become available that people have come to realize the unmitigated curse it actually is. To forego the right to reopen and reexamine issues in the light of new information just because the matter has been previously settled and now a large amount of money has already been spent, is not a sign of sanity. It would be somewhat like letting a wrongly condemned innocent serve out his sentence rather than look at fresh evidence establishing his innocence just because originally the victim had been subjected to a 'fair trial'; or to knowingly eat spoilt food because food costs money.

Nobody can deny those who support the dam their democratic right to express their viewpoint through rallies, demonstrations, slogans, etc. In a proper system we would have one rally bringing pressure on the government to stop work on the dam and reconsider while the other rally would pressurize the government to do no such thing. Each would try to convince the public of the rightness of its cause. The ensuing debate would result in an informed public which could then make up its mind. Unfortunately what is happening on the Gujarat - M.P. border is the very negation of the democratic process.

What we have opposing the entry of anti-dam agitationists into Gujarat is not a mere rally of the people, but a rally which is state supported if not actually state sponsored. It is the state which provides commandeered buses to transport the rallyists, most of whom prefer to spend the cold nights in comfort at home. At times, the distinction between the rallyists and the police has been totally obliterated. Thus, what we are witnessing is an attempt by the State aided and abetted by vested industrial and commercial interests to silence its critics by unleashing on them a counter demonstration of larger numbers. It is besides the point that as days pass these large numbers have found it difficult to match the determination and staying power of those whose very survival is at stake. Even the police has found the place too cold for comfort.

Many credit the Gujarat Chief Minister, Shri Chimanbhai Patel as the mastermind behind this strategy of pitting one demonstration against another. The manipulative skills of Shri Patel are no less renowned than those of Shakuni Mama in Mahabharat. But it is not the amorality of Chimanbhai which is of importance. It is those who have willingly lent themselves to be his instruments who need to reconsider their actions. If this attempt to silence dissent succeeds, then the way would be open for all administrators to resort to rent-a-crowd techniques to crush dissent on any issue whatever, be it environment, communalism, or corruption in the state machinery. In fact, there already has been a great proliferation of fascist methods all over the land. 117 journalists have been killed in Punjab by people who have banned other journalists from calling them 'terrorists'. The attempt to gag *'India Today'* is wellknown. Not so wellknown is the attack on the office of a small bimonthly publication *The Voice of the People* Awakening in Bombay for daring to write an article critical of BJP. Recently a group of Sarvodaya leaders who were peacefully fasting and praying for the restoration of communal harmony in Ayodhya, were badly beaten up by hoodlums belonging to the Bajarang Dal who were proud of the fact that they belonged to the 'Godse' tradition. The police in this case intervened by arresting the peaceful demonstrators instead of taking any action against those in flagrant violation of the law, because to even touch these 'sacred bulls' in Ayodhya today is to invite disaster upon oneself. But whether out of cowardice or out of collusion, the fact remains that the State today is a participant in the attempt to subvert the freedom of expression.

Mahabharat is a recurring theme in our culture. It is a tale which can be and has been viewed at many levels and which furnishes many morals. A quarrel between brothers which ultimately led to universal destruction. A war which became inevitable because decent and respectable men decided that standing up against injustice was not necessary and discretion was politic. A fight of right against might in which both sides sometimes indulged in morally indefensible actions but in which Dharma ultimately triumphed against seemingly invincible state power.

Just as we go to the press, distressingly late as usual comes the very welcome news that Medha Patkar and her colleagues have given up their twenty two days fast and the agitation is to enter a different phase. We applaud the realisation that the environmental movement in India needs life not death. Some may consider this retreat, a defeat. 1 don't. Mahabharat was not won or lost at Kurukshetra. It was a battle in the field of Dharma, where only Dharma could be victorius.

Surendra Gadekar

Last year, Argentine President Carlos Menem announced that a nuclear waste dump planned near the village of Gastre in the region of Patagonia, was to be abandoned, or "frozen", at least until the year 2040. Yet at least 70 people are presently working at Argentina's National Commission for Nuclear Energy on the project Another 50 people are at work on the same project at the National University of Cuyo. The planned dump has been opposed for a number of years by activists and communities in both Argentina and Chile. Now, the plan is receiving support from France. When Juan Schroeder, an anti-nuclear campaigner denounced the French connection, he and later his family, began receiving death threats. What Schroeder was objecting to were plans by the French Government to export nuclear wastes to Argentina. Despite Menem's declaration, the decree which established the project has never been revoked. The manager of the project said in a public debate "the work for the dump site proceeds normally."

The Sterilized Zone (Part II)

We continue our series on Nuclear Off site Emergency Response Plans. In our last issue, we had briefly focused on guiding principles, types of accidents, radiation hazards, and given a bare outline of the protective measures envisaged and defined the concept of emergency zones. We shall consider different protective measures in detail in future issues. In the following we focus further on general principles.

Underlying Principles

The principles which govern the planning of protective measures in the event of radiation accidents are based on the following :

In the event of an accident, protective measures may need to be implemented to limit the radiation exposure of the members of the public. However, the implementation of these protective measures can involve social cost, risk inconvenience and hardship to those involved. Therefore, any protective measure should be introduced only if the from further exposure to radiation would be greater than the detriment to the health and social life that would result from the protective measure itself.

The concern for risk, inconvenience, and hardship caused to the public is indeed touching and very commendable. But would not this concern be far more appropriate if shown during the site selection process itself. The risk imposed on the public even during the routine operation of the plant, let alone during an accident, is quite considerable and totally Involuntary. The people near a nuclear plant accept the risks imposed by the plant only because they are ignorant of them.

Secondly, who decides which risk is greater: whether from further radiation or from implementation of the protective measures? In the nucleocrats' scheme of things, the answer is obvious: officials decide. They have the knowledge, they have the information, they have the scientific detachment and 'objectivity': the public on the other hand is ignorant and is incapable of understanding such 'technical' issues. The fact that the officials also have vested interest in keeping the nuclear enterprise going and in minimizing its problems and risks, is besides the point. Also irrelevant is the fact that the officials who make the decisions between different levels of risk are not the ones who are incurring the risks themselves but the guys sitting In Bombay. But then that is what objectivity is all about! (See discussion on Intervention Levels)

Risk from stochastic effects should be limited by introducing protective measures so as to achieve a net positive benefit to the individual. Examples of stochastic effects are cancers, genetic mutations, etc., for which there is no minimum radiation dose or threshold for initiation. These effects cannot be predicted for any specific individual but can only be estimated as an increase in their probability of occurrence in proportion to the dose among the exposed population.

Serious non-stochastic effects should be avoided by introduction of protective measures to limit individual exposures below the threshold value for these effects. Examples of non-stochastic effects

PROBABLE EFFECTS OF ACUTE WHOLE BODY DOSES

Dose in rems	**Probable** Effects
0 — 25	No detectable clinical effects. Probably no delayed effects.
25 — 100	Slight blood changes with later recovery. Possible nausea. Delayed effects possible but serious effects improbable.
100 — 200	Nausea and fatigue, possible vomitting. Reduction in certain blood cell counts with delayed recovery.
200 — 300	Nausea and vomitting on the first day. Two week latent period followed by general malaise, loss of apetite, diarrhoea, moderate emaciation. Possible death in two to six weeks; for most healthy individuals recovery likely.
300 — 600	Nausea, vomitting, diarrhoea in the first few hours. Short latent period followed by epilation (loss of hair), loss of apetite, general malaise, then haemorrhage, emaciation, purpura (an eruption of small purple spots of the skin), diarrhoea, inflammation of the throat. Some deaths in the first weeks. Eventual deaths to about half the individuals at about 450 rems.
1 600 and more	Nausea, vomitting, diarrhoea in the first few hours. Short latent period followed by diarrhoea, haemorrhage, purpura, inflammation of the throat, fever by

are skin reddening, epilation, (falling of hair), changes in blood chemistry, vomiting, etc. for each of which to occur there is a definite threshold radiation dose value.

This table of probable effects of acute whole body doses, Illustrates the nuclear mindset as nothing else can. The whole attitude which permeates the nuclear effort Is right there In black and white— Up to 100 rems: "delayed effects possible but serious effects Improbable" — this from the same guys who Just a few lines previously write, "stochastic effects are cancers, genetic mutations, etc. for which there is no minimum dose or threshold for initiation." Let us consider the delayed effects If Just a 1,000 people each get this dose. According to the latest report of the U.S.Committee on Biological Effects of Ionizing Radiation (BEIR-V) — the nucleocrats' own bible — this much dosage would result in anywhere between 8.6 and 42 persons getting fatal cancer. This itself Is an enormous number, hundreds of times larger than 'normal' Incidence. However, many Independent scientists consider this estimate too low. (Over the years, the BEIR committee has a record of periodically revising their probable cancer numbers upwards). Dr Goffman's calculations show that it would be more like 266 which is more than one fourth of the population irradiated. But to Indian nucleocrats these fatal cancers are nothing "serious." What they demand as proof of hazard are dead bodies littering the streets, as in Bhopal. Alas, Bhopal has shown that even that horror is perfectly acceptable — since there is "net benefit to the individual."

High acute doses of radiation cause immediate problems. (See Table on previous page). These symptoms are a cause of worry not only to the poor afflicted patients but also to public—relations conscious nucleocrats. Therefore, the philosophy is, use protective measures to try and keep individual doses below the threshold where Injury becomes quickly apparent. As far as other effects such as cancers and genetic abnormalities are concerned, they take a long time to manifest themselves and therefore the risk of introducing the protective measures can safely be balanced against the risk of producing cancer later, so as to "achieve a net positive benefit to the individual." However, unfortunately, these cancers are not Imaginary — they do occur and to those who get them tills *talk of "net benefit" is a cruel Joke.*

Intervention Levels

Intervention levels serve as aids in planning and decision making during an emergency. Expressed in terms of projected radiation doses, they provide guidance on the need to take specific protective measures, such as evacuation, sheltering, thyroid blocking and banning consumption of affected foods. Intervention levels are laid down as a lower and an upper level. Below the lower level, the protective measure would not normally be justified. At or above this level the measure is recommended for implementation unless valid reasons exist for deferring action. At or above the higher level, the measure is mandatory unless implementation entails demonstrably greater risks for the people involved.

Intervention levels also illustrate the Indian nuclear mindset admirably. For one thing, they are amongst the highest in the world. For example Britain recommends a lower level of 0.3 rem for sheltering while it is 1 rem in India. But the most dangerous level here is the lower level recommended for banning food consumption. One rem per year for the general population is Just way too high. If food contaminated to this level were to be eaten by the whole population of the country, it could result in anywhere up to two million cases of new cancers every year. Since this is the lower level, nucleocrats consider action banning food consumption at less than this level as inappropriate. The mandatory upper level of five rems a year Is Just out of this world. (May be nucleocrats are actually secret population control agents). For comparisons sake, the recommended public radiation exposure level in the US (where too the same breed rule the roost but public conciousness is somewhat greater) is one tenth of a rem.

Intervention Levels for Radiation Exposure

Protective Measure	Lower Level in rems		Upper Level in rems	
	Wholebody	Thyroid	Wholebody	Thyroid
Sheltering	1	—	5	—
Sheltering and Thyroid Blocking	1	2	5	**10**
Evacuation	2	20	10	**100**
*** Banning food** consumption	1	10	5	**50**

*** : Consumption** of contaminated food would deliver **this** dose **in** one **year.**

The Cancer Controversy

Since gamma or penetrating radiation is a normal constituent of the atmosphere, repeated exposure to a small dose of ionizing radiation is an inescapable condition of life on this planet. There are several reasons to believe that these inevitable exposures could cause cancers and birth defects.

But it has also been argued that background radiation is a benign influence which provides essential stimuli to the immune system. With universal exposure to this more or less constant dose of background radiation, and no alternative sources of radioactivity, it might have remained impossible to refute this optimistic view. However, man-made sources of radioactivity should make it possible for epidemiologists to arrive at the correct conclusion.

Studies of the health effects of very small doses of radiation face three design problems: how to accurately measure the radiation doses large numbers of persons have received (the dosimetry problem), how to prevent comparisons between exposed and unexposed groups from being bedeviled by other differences (the selection problem), and how to cope with the varying lengths of cancer latency (the follow-up problem). These technical problems lie at the center of the debate about the cancer effects of low-level radiation, and the cancer issue is central to the controversy about nuclear technology. Therefore, it is important to appreciate the strengths and the weaknesses of the more important surveys of radiation effects that have been conducted. These include a mortality study of the Japanese atom bomb survivors, carried out by the Radiation Effects Research Foundation (RERF data), a similar study of workers in the nuclear weapons industry (Hanford data), and the Oxford Survey of Childhood Cancers (OSCC data).

RERF data

This ongoing survey began five years after the bombing of Hiroshima and Nagasaki and is still keeping tabs on 80,000 survivors. It is estimated that several members of this study population received a very high (over 100 rad) dose of gamma radiation. But two thirds of the group are believed to have received under 10 rad, which is less than the usual lifetime dose from natural background radiation.

Over the years there have been many comparisons of the mortality rate of these survivors and of other Japanese citizens born at the same time (external or exposed / unexposed comparisons), and also between groups of survivors who experienced different dose levels (internal or graded-dose comparisons). The results of this work have always been the same: cancer deaths have always appeared to occur in direct proportion to the estimated dose received; and for other causes of death there has always been an impression that no significant differences existed between groups of exposed and unexposed persons or between groups of survivors who received low and high doses.

On the strength of these observations, RERF investigators long ago decided that the only late effect of radiation was cancer. In other respects there were no material differences between A-bomb survivors and their Japanese contemporaries. For this reason, the safety recommendations of the International Commission on Radiological Protection (ICRP) and the World Health Organization (WHO), and all the cancer risk estimates contained in the latest report of the U.S. Committee on Biological Effects of Ionizing Radiation (BEIR V) are based on the following assumptions: If a population if exposed to ionizing radiation (excluding prenatal exposures), there will be no late effects apart from cancer, and the risk of any individual developing cancer, will be directly proportional to the dose received (straight line or linear dose relationship). There is also general agreement that RERF data are probably the most reliable source of cancer risk estimates for occupational exposures and other low-dose situations, although there is no reason why the findings of other high-dose studies, such as the British ankylosing spondylitis study of late effects of radiotherapy (refereeing to a rare disease involving spinal fusion), should not be used to supplement RERF data.

Despite the general consensus, one has only to consider the appalling state of Hiroshima and Nagasaki in the autumn of 1945 and the following winter to realize that a number of questions have been left unanswered. For example how could thousands of injuries from the blast as well as radiation have had no effect on the makeup of a population of five-year survivors? Would survivors of such injuries (to say nothing of general devastation) not have had stronger constitutions than non-survivors? Finally, why have there been no tests of a relatively simple theory, namely, that, at high dose levels, in addition to cancer, there may be other harmful effects of radiation, such as immune system damage, which were counter-balanced statistically by the "beneficial" effects of the early deaths, that is the selective survival of exceptionally fit persons?

With only one bomb in each city, any selection effects of the early deaths would be as strongly dose related as any late effects of radiation. Therefore a balancing act between contrasting effects of selection and damage to the immune system could easily leave a false impression that neither effect had occurred.

In 1978 RERF scientists looked for and failed to find, any signs of selection. But ten years later, when RERF released a data tape relating to deaths from 1950 to 1982, George Kneale and 1 had the opportunity to do what should have been done much earlier—namely, to apply to non-cancer deaths a statistical test of *simultaneous* effects of beneficial and harmful influences.

Such a test was not difficult. When applied to 24,461 non-cancer deaths it produced evidence of two opposing effects which were dose related but not exactly balanced. Below 100 rad a beneficial effect was in ascendancy, but above this level it was clearly the weaker of the two effects. When deaths from heart attacks and strokes were excluded, it was possible to see that the remaining deaths, including all deaths from infections, were most affected by the two contrasting influences.

There is, as yet, no sign that this independent analysis of RERF data will influence official recommendations concerning radiation exposures. If, however, we are correct in assuming that the beneficial effect is selection, and that the harmful effect is immune system damage, there should certainly be changes. For example, the lasting selective effect of the early deaths would make it necessary to revise opinions about the general validity of RERF data, and a lasting effect of immune system damage would make it necessary to revise opinions about the best method of estimating cancer risk. The method currently approved by ICRP and other authorities, "linear extrapolation of high-dose effects," merely requires applying a straight line or linear dose equation to cancer deaths of A-bomb survivors or radiotherapy patients. But if cancer is not the only late effect of exposure to high levels of radiation, the current risk estimates for low doses should be replaced with estimates based on the cancer experience of nuclear workers.

Hanford data

One of the oldest and largest of several U.S. centers for research and development of nuclear weapons is Hanford Nuclear Reservation in Washington State, where the main activity, since 1943 has been the large scale production of weapons-grade plutonium. The employment records of Hanford workers indicate their annual doses of external radiation, initial job title and subsequent changes, results for all tests for internal radiation (which are known collectively as bio-assay data),and the results of tracing cause of death through social security death benefit claims. These data have been examined by two rival groups of epidemiologists. Thomas Mancuso, George Kneale and I (MSK) examined these records in 1977, but were later replaced by scientists from the Battelle Pacific Northwest laboratory (PNL).

We found a detectable cancer risk at supposedly safe dose levels, well below the maximum permissible dose for external radiation, five rad per annum. According to PNL, this is not so, and one sign that "all is well" is that Hanford workers have a lower cancer death rate than the expected rate for all U.S. citizens of comparable age.

The MSK argument is as follows: The low cancer death rate is merely the result of the fact that sickly persons were excluded from employment at Hanford. This so-called healthy-worker effect is typical of all well-paid industries, and may be different for workers in the same industry doing different types of work.

Inspections of Hanford job titles revealed so many changes (presumably avoid exposures above the maximum permitted dose), and so many meaningless titles (presumably to meet secrecy requirements), that we decided to equate danger levels of work at Hanford with the frequency and the results of bioassay (internal radiation) tests. This decision was followed by a statistical analysis of the effects of *external* radiation, with and without controlling for danger levels. With this control, there was a definite evidence of a cancer risk, and without it the evidence "disappeared."

PNL, who recognized four groups of "main occupation" and ignored frequent job title changes, argued that the MSK use of the bioassay data produced "an artificial bias towards a positive correlation of radiation exposure and mortality." This criticism might be relevant if MSK had categorized workers according to the sum of all their bioassay tests, but in fact we assigned workers *annual* positions on the danger scale. PNL has now conceded that, even without the MSK type of control, there is evidence of a radiation effect for one type of cancer (multiple myelomatosis), a disease of the bone marrow, which "has persisted with additional follow up."

The dispute persists regarding interpretation of Hanford data, which for our part is based on records up to 1977. On July 17, 1990 however, the U.S. Department of Energy released all records of Hanford workers to 1981, which my colleagues and I will examine over the coming months. This is only the first batch of records, which will eventually include follow-up to the present date of workers at all important Department of Energy facilities.

Nothing of much value has thus far come from other studies of nuclear workers, which have had shorter follow-up periods and/or involved smaller numbers. As a contribution to the low-level radiation and cancer controversy, the Hanford studies to date clearly rate very low. But in conjunction with other studies of nuclear workers they hold out the promise of a final resolution of the question by the end of the century.

OSCC data

The first evidence of any cancer effects of low-level radiation came from comparing the medical records of children who died from leukemia or other forms of cancer in Britain (cancer cases) with those of healthy children from the same regions (live controls).These comparisons showed that members of the group who developed cancer had been X-rayed before birth twice as often as members of the control group.

This crucial finding of the Oxford survey dates back to 1956. Similar studies of cancer deaths have continued in later years. The later work not only confirmed the original X-ray findings but also showed that all childhood cancers have *in utero* origins. Eventually, with national coverage of all cancer deaths of children under 16 years of age from 1953 to 1980 (22,531 cases), and with independent measurements of the background radiation for each 10-kilometer square of the country (there is considerable variation in the terrestrial component of these doses), it became possible to assess the potential cancer effects of background radiation. Seizing this opportunity, the Oxford survey showed that prenatal exposure to background radiation is an important cause of childhood cancer and is possibly the *only important* cause; for more than half the OSCC cases, these early exposures were the apparent cause.

There were several reasons why the Oxford survey group could complete such a difficult task. By interviewing mothers, including those of control subjects, it was possible to assemble a wide range of case and control records from several places including prenatal clinics, hospitals, and X-ray departments. Also, the Oxford survey had records of climate and population density, as well as annual numbers of live births, stillbirths, and infant deaths for over a thousand local authority regions. With such voluminous data it was possible to recognize events which had a direct effect on cancers, such as post-natal X-rays (harmful effect) and inoculations against infections (beneficial effect), as well as events which made it difficult to recognize the true frequency of childhood cancers because they operated as "competing causes of death." Competing causes included stillbirths, infant deaths, and infection deaths of older children — which were found to have an exceptionally strong association with leukemia. By steering a straight course between a host of confounding variables, the Oxford survey detected the effects of natural background radiation and showed that it was harmful in the same way that pre-natal X-rays are harmful; that is by causing cancer mutations.

Conclusions

Both the bombing of Hiroshima and Nagasaki in 1945 and the use of radiotherapy made it inevitable that studies of A-bomb survivors and hospital patients would take precedence over studies of nuclear workers. Ideas about possible effects of natural background radiation were bound to be coloured by what is known today as RERF data and the ankylosing spondylitis survey.

According to these sources, it would be safe to assume there are no late effects of radiation apart from cancer, no lasting selective effects of early deaths of A-bomb victims, and no cancer risk at low dose levels (below 20 rad). At the same time, a rapidly expanding nuclear industry successfully avoided the troubles with afflicted radium luminizers in the 1930s simply by obeying a rule that workers receive no more than five rad per annum. The nuclear establishment had good reason to believe that a potentially dangerous situation had been completely diffused, and optimists were still free to regard daily exposure to background radiation as a benign influence.

For several years the only indication to the contrary was the Oxford survey's finding on prenatal X-rays. But today we face the possibility that there are other late effects of radiation besides cancer; and the possibility that the selection effects of he two nuclear explosions are still reflected in the death rates among survivors and are the reason why no cancer effects have been found at low dose levels If these possibilities are confirmed, we may one day realize how fortunate it was that the Oxford survey findings put a brake on the enthusiasm of nuclear power advocates. Otherwise we might never have pressed for direct studies of the effects of low doses of radiation.

Source: Alice M. *Stewart*
Bulletin of Atomic Scientists September 1990

Editor's Note: There are a number of references to this article which are available in the *Bulletin*

Voices of Warning

The Greek legend of Cassandra, the princess whose gift of prophesy was unfailingly accurate but never believed, was no doubt a story born in reaction to the earlier destruction of much of the Aegean ecology by the Mycenaean civilization in the centuries before 1000 BC. That destruction was so widespread and devastating — the forests that once covered the Mediterranean coast were **cut down,hills opened to erosion, grasslands made into deserts by spreading herds — that it lead to the collapse and obliteration of Mycenaean culture and subsequent Greek 'dark ages'. Some voices, surely, there must have been crying out against that destruction, warning of the consequences if foresters continued to cut the trees and the herders to unleash their flocks, promising that civilization** itself would come to an end — and yet, just as surely,they were ignored, probably scorned and derided. The memory of all this most likely led the later Greeks to imagine such a seer as Cassandra and device the myth of her futile prophecies.

And so today, the signs are all around us, the evidence apparently incontrovertible, the voices raised in warning. And yet like the Mycenaeans — and the Romans, the Sumerians, the Mayans, the Harappans, the Tang Chinese, and others — the rulers of this civilization refuse to hear, refuse to change.

Those of us who are Cassandras by profession and inclination might be moved to despair: at times it seems so illogical to speak what to gods have determined will be ignored. Yet, what else can one do?

I am moved to these thoughts by the latest bit of cassandraic evidence to cross my desk. According to the largest and the most comprehensive recent reports of cancer deaths in industrialized nations — published in *The Lancet,* August 25, 1990, written by an American professor, the director of the UK census office, and the director of the World Health Organization's statistics office — the rates have been soaring alarmingly. Between 1968 and 1988, rates of brain cancer and bone-marrow cancer in people over 65 increased by 50 to 600 per cent, depending upon the industrialized country selected, and kidney cancer, breast cancer and lymphoma by 10 to 50 per cent. Overall cancer mortality, high enough to begin with in the sixties, has immensely magnified in just twenty years.

These are deaths in industrialized countries —7 the US, Japan, UK, and three other European nations — and it is industrialization that has caused them. Epidemiologists are agreed that environmental factors, particularly air pollution and toxic waste in ground and water, and dietary regimens, are the culprits.

And no, it is *not* a matter of better reporting or diagnosis of disease,nor of old people simply living longer. Those factors were considered and discarded in this study, with the conclusion that the increased mortality — the sharply, startlingly increased mortality, I might say —. is simply the result of the way Western civilization has chosen to evolve.

And does such news make the front pages, prompting cries of anguish and alarm from officials in charge of our health, from activists eager to protect citizen victims? Hardly. The report appeared in *The New York Times* on page 18, effectively buried, and it was accompanied by business-as-usual disclaimers from medical and governmental officials. "The statistics here are well known," said the yo-yo who is the deputy director of the division of cancer prevention at the National Cancer Institute outside Washington. "I don't think it is telling us anything really new."

Well, if it's so bloody well known, why don't more people know it? And if it's nothing new, why hasn't something been done about it?

Cancer is the very clearest early warning device that this civilization has. It is as indisputable as death, as sharp as pain. If death rates are going up, on average, more than 300 per cent over the last twenty years, this is a horrible indictment of the way industrial society lives — and does.

And yet the message, for all its clarity, is ignored. Cassandra will not be heard.

Kirkpatrik Sale
Resurgence No 143 November/December 1990

When pollution levels in Copehagen , mark. rise above the World Organisations' standard, Friends of the Earth's anti—smog network swings into action human chains block traffic on main roads for several minutes during the rush hour. have had to bear some heavy fines blocking traffic, but together with a coalition of trade unionists, cyclists and senior citizens, they're determined to win an alternative traffic plan for the city. The plan includes percent cut in traffic, a light rail line, a better bus service and improved bicycle access.

A Tale of Two Superpowers

Many 'defense' analysts including Gen Sunderjee and Jasjit Singh have recently been arguing that India should "exercise its nuclear option." In plain words, openly declare its intention to make nuclear weapons and then proceed to make and test them along with their delivery systems. This is supposed to lye a cost-cutting measure! Right now, we are not going into the merits of this thesis, but merely present a short account of the human cost to the bomb-makers themselves of the very first bomb making efforts at Hanford in U.S.A.,and Chelyabinsk in the Soviet Union. The portion regarding U.S efforts appears as an editorial by Len Ackland in the September 1990 issue of Bulletin of Atomic Scientists We would strongly recommend activists to read this issue of the Bulletin in depth since it is specifically devoted to the health effects of low-level radiation. The material on the Soviet Union has been prepared by Thomas Cochran and Robert Norris and published as a paper in a series called Nuclear Weapons Databook.

Human Guinea Pigs

Tom Bailie, a farmer born in 1947 near the Hanford nuclear weapons production complex, has long believed that his thyroid disease and sterility as well as the cancer affecting relatives and neighbours were caused by the radiation emissions from the complex. "I'm not antinuclear, " he said, "but what they did to us was industrial recklessness and stupidity."

"They" were a large, if undefined, number of US government officials, scientists and contract employees who ordered or knew about the regular releases of dangerous radiation byproducts, including radioactive iodine, from Hanford. These emissions were measured by the government, but kept secret for decades from Bailie and some 270,000 other residents of a 10-county area around Hanford. Finally, under pressure from local public interest groups (mainly Hanford Education and Action League (HEAL) — a group with whom *Anumukti* has an exchange arrangement) which filed Freedom of Information Act requests, the US Energy Department in 1986 declassified and released documents about Hanford's emissions. But the government refused to acknowledge that the radiation could have caused illness.

That policy of denial abruptly changed on July 11, 1990 when US Energy Secretary James Watkins admitted at a news conference that some residents in the Pacific Northwest US had received high radiation doses to the thyroid. Not Coincidentally, Watkins's rather generalized announcement preceded by a day the release of a two -year Energy Department financed study by an 18-member panel of scientists and other citizens. It disclosed that 13,700 persons — 5% of the 10-county population, — had on the average each absorbed a radiation dose of 33 rad (equivalent of about 1650 chest X-rays) from late 1944 to 1947 and that an undetermined number of children might have received doses as high as 2,900 rads to their thyroids.

"We learned several years ago that the Government decided —with cold deliberation— to use us as guinea pigs by releasing radioactivity into our air, water, milk and food without our consent," Bailie wrote in *The New York Times* after the recent revelations. "Now, we've learnt that we can expect continuing cancer cases from our exposure in their 'experiment.' Is this what it feels like to be raped?"

Bailie feels abused and betrayed by his government. "Moscow was condemned for its three days silence after the Chernobyl nuclear accident. What about Washington's 40 years of silence?"

The question should resonate across USA. Tom Bailie didn't volunteer for a hazardous Cold War waged in part by the large scale production and testing of nuclear weapons. Even if his family, and the hundreds of thousands of other families living around the nations nuclear plants and the Nevada Test Site, had volunteered, they should have been fully informed of the risks. As new information became available, it should have been passed along. Such a civilized procedure should have also been followed with the estimated 600,000 to 1,000,000 men and women who worked in the U.S. nuclear weapons plants from World War II to the present. Instead, secrecy was the rule, "national security" the justification.

At the very least, society owes all of these people, these victims and potential victims of the Cold War, a thorough accounting of the health risks they incurred from radiation exposure and medical care for those who need it. Most of their exposure involves relatively low-level radiation, a phenomenon which is causing considerable controversy with regard to nuclear power plants, nuclear waste and other sources of radioactivity.

The Most Contaminated Spot on Earth

In early 1942, the possibility of an atomic bomb became a serious issue for the Soviet leadership. In the university library at Vornezeh, Flerov noticed that articles on nuclear fission were no longer being published in the West, a sign to him that secret work was under way. In May, Flerov wrote to Stalin that "we must build the uranium bomb without delay."

By the time of the Potsdam Conference, in July 1945, the Soviet Union had a serious atomic bomb project underway. After one conference session, Truman casually mentioned to Stalin that U.S.A. had a "new weapon of unusual destructive force." Stalin told Truman he hoped the U.S.A. would make "good use of it against the Japanese." He also ordered his scientists " to provide us with atomic weapons in the shortest possible time." One day after Hiroshima, Stalin put his secret police chief, Lavrenti P. Beria in charge of the Soviet version of the Manhattan Project. The first Soviet atomic bomb was assembled at Chelyabinsk and tested on August 29, 1949.

The Soviet Union followed a pattern of nuclear weapons materials production similar to that followed by U.S.A. Each began with construction of natural-uranium fueled, graphite moderated, reactors for plutonium production and development of gaseous diffusion technology for the enrichment of uranium. Today, the Soviet Union relies on both graphite and heavy water moderated reactors for plutonium and tritium production. The government announced in 1989 that it was ceasing the production of highly enriched uranium.

Production Sites

Soviet plutonium and tritium production for weapons takes place at three locations:

Chelyabinsk-40, near Kyshtym in the Urals, at Siberian Atomic Power Station near Tomsk and on the Yenisey River, 10 km north of Dodonovo in Siberia. Prior to 1987, there were as many as 14 production reactors at these sites — six at Kyshtym, five at Tomsk and three at Dodonovo. Between 1987 and August 21, 1990 four of the production reactors at Kyshtym and one at Tomsk were closed down. The fifth reactor at Kyshtym was scheduled for closure in October 1990. In October 1989, the Soviet Union announced that it intends to cease plutonium production by the year 2000.

The Kyshtym Complex

Called by its post office box address, Chelyabinsk40 is not marked on maps of the Soviet Union. It is about 15 km east of the city of Kyshtym on the east side of the southern Urals in Chelyabinsk province. It is located in the area around Lake Kyzyltash, in the upper Techa River drainage . basin among numerous other lakes with interconnecting watercourses. Probably fashioned after U.S. Hanford reservation, it was constructed in 1945-46 reportedly using the labour of approximately 70,000 inmates of labour camps. Spread over 90 square kilometers, it employs some 10,000 people. Its population including dependents is variously estimated to be between 83,000 to 100,000.

Radiation Exposure to Workers

The period 1948—1952 is characterized by exceedingly high exposures. At A—Reactor the *average* annual worker dose peaked at 93.6 rem in 1949, the first full year of operation: and at the chemical separation plant the annual average dose peaked at 113.3 rem in 1951. From 1949 to 1951, 0.5 per cent to 1.8 per cent of the workers were receiving more than 400 rerns annually, which is 80 times the current occupational exposure standard (and considered by many to be way too high!)

Waste Management Activities

Radioactive waste from chemical separation plant at Chelyabinsk is now converted into, special glass, placed in stainless steel containers, and stored in cans in a special storage facility at the site. This, however, was not always the case. In fact, during the early years radioactive waste management was nonexistent.

According to the official report, "During the first five years of the operation of the enterprise in this branch of industry there was no experience of scientific development of questions of protecting the health of the people or the environment. Therefore, during the fifties there was pollution of individual parts of the territory and around the enterprise." These bland words actually mean that from its beginning in 1948 through September 1951 all radioactive waste was discharged directly into the Techa river.

In 1951, after radioactivity was detected as far away as the Arctic Ocean (more than 1,000 km from Chelyabinsk) a new solution was adopted. The wastes were dumped into Karachay Lake which has no outlet. The Techa river and all its floodlands (8,000 hectares) were excluded from use by people. The Karachay Lake is a 45 hectare natural lake or (bog). It eventually accumulated 120 million curies(MCi) of long lived radionuclides cesium-137 and strontium-90. For comoarison this is about 100 times the amount of these radionuclides released by the Chernobyl disaster. In the 1960s it was discovered that radioactivity from the lake was entering the ground water. Efforts to eliminate the reseivoir began in 1967.

> **"It's hard to imagine what we could do with nuclear weapons to their [the Soviet] economy that they haven't already done to it themselves."**
> **U.S. Congressman Les Aspin**

The area of the lake has shrunk to 25 hectares. Today, radioactivity in the ground water has migrated two to three kilometers from the lake. On the lake shore the radiation exposure is about 600 rems per hour enough to kill a person within one hour. In 1967, a hot summer followed by a dry winter. The water evaporated and dust from the lake bed was blown over a vast area, up to 75 km long,affecting 41,000 people. The lake is now slowly being filled with hollow concrete blocks, rock and soil to reduce the dispersion of radioactivity.

Waste Explosion in 1957

During the initial period of operation of the chemical separation plant the irradiated fuel rods were treated by an all acetate precipitation scheme. After the fuel had been dissolved in nitric acid, and the uranium and plutonium had been extracted, radioactive solutions were formed which contained as much as 100 grammes per litre of sodium nitrate and 80gms/l of sodium acetate. The solution was stored for a year in tanks in order to reduce the radioactivity and cool prior to further treatment for plutonium extraction. After treatment, some portion of the solution was returned to the storage tanks and the less radioactive part dumped into Lake Karachay.

The intermediate storage facility consisted of a rectangular buried concrete canyon with wall 1.5 metres thick designed for holding 20 stainless steel tanks each with a capacity of 300 cubic metres. The tanks were entirely immersed in water and utilized an external cooling system. Some of the instruments for monitoring the tanks failed and could not be repaired due to the very high radiation field in the canyon. As the solution in the tanks evaporated, the tanks rose breaking the seals in the waste transfer lines and contaminating the cooling water. Because of insufficient production capacity the tanks were switched to "periodic cooling mode." The cooling system in one of the unmonitored tanks failed however and the wastes began to heat up and dry out. Nitrates and acetates in the waste precipitated, heated up to 350° C and on September 29, 1957 at 4.20 PM local time exploded with a force of nearly 100 tons of TNT. Some 20 million curies of radioactivity were released to the atmosphere. The largest nuclear disaster previous to Chernobyl.

About 90% of the radioactivity fell in the immediate vicinity of the vessel. Radiation levels within 100 metres of the crater were 400 rems per hour: at 3 km the levels were 3 rems per hour. In a twenty square km area of extreme contamination all the pine trees perished within a year.

There were 217 towns and villages with a combined population of 270,000 who were significantly contaminated. Virtually all water sources were contaminated.

The Situation Today

At some unspecified date, waste storage was shifted to double walled, stainless steel tanks, which have leaked on occasion but have undergone repairs. Concentration and immobilization of high level waste into glass blocks is being carried out. After 30 to 40 years of air cooling, the Soviets plan to bury the waste in granite or salt formation. The government has been looking in the region of the Urals for a possible burial site, but has been facing public opposition.

The Techa River is cordoned off with a wire fence and people are forbidden to catch fish, pick mushrooms or berries or cut the hay. There are 450 billion cubic metres of radioactive water in open reservoirs. Fish in Reservoir No. 10 are reported to be "100 times more radioactive than normal.

As the Soviet weapon's production winds down a new environmental threat has arisen in Chelyabinsk. The massive production complex with its six reactors used to utilize contaminated water from the lakes, thus regulating the water level. With five of the six reactors now closed, the reservoirs might overflow with natural water and possibly even cause failure of dams, sending contaminated water into the rivers of the Ob basin. To counter this threat (among other more 'cogent' reasons), the authorities have proposed a new South Urals Nuclear Power Complex. Work on two large fast breeder reactors began in 1984 But since 1987 construction is at a standstill, firstly because there is no money and secondly due to public protest.

Editor's Note:

We have previously published in Anumukti. various articles and a poem (see last issue) which describe the agony and the betrayal felt by the Hanford downwinders, as well as the horror of Kyshtym. The reason for this repetitiousness is that Hanford and Chelyabinsk are not something that happened 40 years ago in another country. They are happening today in ours. The nuclear mindset makes them inevitable. The question that needs to be posed to defense strategists is: Who are you trying to defend with the bomb? Is it the people? Is it the land? Both get contaminated in the very process of making the bomb. One kills one's own.

LETTER box

Sanctuary is a bimonthly publication which focuses of wildlife and ecology related issues and publishes some dazzlingly beautiful photographs,along with very informative articles. Sometime back I was pleasantly mystefied to receive a spate of letters all carrying the same message pledging opposition to nuclear power and a readiness to disseminate information on the subject within one's community. The mystery was resolved when I received a copy of Sanctuary along with a letter from its editor Bittu Sahgal. The crux of the matter was the response to the deadly disinformation campaign launched by the Nuclear Power Corporation (NPC), through a series of advertisements which have appeared very widely in various publications including Sanctuary. Some readers had strongly objected to this. Below we reproduce a sample of their protest.

Having known *Sanctuary* to be a truly concerned magazine, I was rather dismayed to find an advertisement of the Nuclear Power Corporation glorifying nuclear energy as a safe technology. The presence of this advertisement is particularly ironic in the view that the report "Goa could go" was also printed in the same issue. Are you so hard up for advertisements that this kind of misleading propaganda should be accepted? 1 would prefer to believe that this was a slip up on your part.

S.Lakshmanan
New Delhi

It seems incompatible with the purpose and interests of *Sanctuary* to use advertisements from corporations such as Nuclear Power Corporation. For too long we have stripped our environment in the name of development of the masses. Such a state of affairs is being perpetrated by the hegemony of a certain power class who control the information banks, and by the ballot gain their power to maintain a bureaucracy as corrupt and selfish as itself. They dupe the masses into believing the the destruction of our nation's natural non-renewable resources, its irreplaceable heritage, is development. I think I will be representing a large section of environment-conscious readership in requesting you in future to refrain from using such advertisements.

Bulu Imam
Hazaribagh

Sanctuary 's *Reply:*
We had initially rejected the idea of carrying the advertisements, but after discussions with other conservationists we felt that the NPC should be allowed to have its say, with the idea of subsequently challenging their claims as we have done elsewhere in this issue. This is the closest we have been able to come to a public debate on the wholly untenable claims of the all powerful nuclear lobby in Bombay. In the case of Sanctuary Magazine this stance was practical, but the essence of such a media blitz must be condemned because very few other newspapers , or magazines would consider devoting equal space to countering the claims of each of advertisements. We would, however, be very grateful for still more responses from readers on the pros and cons of our carrying Nuclear Power Corporation advertisements.

It further announced its intention to utilize the surplus generated from NPC advertisements in the following manner

- Present one year subscription to *Anumukti* to the first 150 persons who shall sign and send a specified statement directly to *Anumukti.* (Please see *Sanctuary* Vol. X No. 5 - Sept/Oct 1990 for the detailed statement.
- Provide secretarial and other infrastructural assistance to help organize citizens of Bombay to demand greater accountability on the issue of public health from the Tarapur Atomic Power Station authorities. (In this connection they have also invited me to go to Bombay in the month of March to give a series of talks to be arranged on the university campus, in vaious public halls and with organizers of NGOs -Editor)
- *Sanctuary* will petition the *Indian Society of Advertisers,* the *Advertising Standards Council* and the *Consumer Protection Societyto* prevail upon the Nuclear Power Corporation to withdraw their campaign immediately and to issue public statements to inform society that it was misled. It will also send appeals to all members of IENS to counter the propaganda unleashed by NPC by publishing articles and statements which highlight the hazards of nuclear power.

Anumukti's *Stand:*
While the offer of 150 subscriptions is like the proverbial life preserver to the drowning man in our precarious financial state, we do not approve of this idea of "using their money to fight with them," for the following reasons:

- Firstly, it is not their money, its ours. We should not allow anyone to squander public money to misinform the public Granted, we are today too weak to stop this criminal waste, but under no circumstances should we be collaborators.

- Should the onus of providing the forum for public debate be on us? Nothing stops or can stop NPC from having its say, but should this say be at the cost of the hard earned credibility of magazines like *Sanctuary.* NPC have huge resources at their command. The government controlled media are at their beck and call. It is not for the lack of an adequate forum that they have fought shy of a public debate. For forty years they did not feel the need to "educate the public." It is only in the post Bhopal-Chernobyl era, with its rising tide of environmental awareness that they have suddenly woken up. But even now their preference is not for a debate, but for stage—managed shows and this massive disinformation media blitz.

- May be a better form of public debate would be to print their advertisement series "Nuclear Power and You" in *Anumukti* without payment in conjunction with another series of ads, "You and Nuclear Power" (to be produced by us); the only condition , being that the same be simultaneously printed in their in-house magazines like *Nuclear India, Nu-Power,* and other such.

Needless to add that we strongly welcome the other suggestions mentioned by *Sanctuary* and do our utmost to cooperate. We would honour the commitment made by *Sanctuary* with regard to the pledges — in fact, we have already placed all those who responded on our mailing list.

REVIEW

DIMONA

THE THIRD TEMPLE ?

The Story Behind the Vanunu Revelation

Mark Gaffney

AMANA BOOKS (1989)
P.O. Box 678, Brattleboro, VT 05301
U.S.A.

The nation of Israel is an enigma. On the one hand it is a state as described in this book:- Unjust, brutal and repressive towards its non-jewish population; belligerent towards its neighbours; uncaring, at times even contemptuous of world opinion; willing to engage in one outrageously criminal act after the other; prepared to carry its obsession with security to an extent that it seems willing to bring nuclear holocaust upon the world; indeed a pariah nation.

But, there is another side to Israel. No other people in history have been as persecuted as the Jews. For more than a millennium, they were the only victims available to the Western Uncivilization. Gandhi correctly described Jews as "the untouchables of the world." After being denied land-ownership for more than two thousand years, the transformation in agriculture that the Jews in Israel have brought about in the last hundred years seems nothing short of miraculous. It is the land where the most innovative and radical ideas have been put into practice; where socialism of the kibbutz is still a living idea: it did not degenerate into the 'New Class' as it did in nations where it was the officially sponsored ideology; a country which is alive and vibrant in its arts and sciences; a place way ahead of almost everybody in solar energy research ...In short, it is indeed, the Promised Land.

Recently, I was talking to an Israeli friend. He was totally opposed to the politicians now in charge of the country. "Politics in Israel is worse than in India The same leaders have mislead for more than 20 years. Yet, he defended their policies with great and what I felt as unnecessary vigour. But he admitted one thing. The moment Israel was ready to use nuclear weapons on anyone, it would lose all moral justification to exist.

Mordechai Vanunu, for eight years a nuclear technician at the Dimona research facility in the Negev desert is presently serving an eighteen year prison sentence. This is his reward for having dared to expose the true state of affairs with regard to nuclear weapons development in Israel. He was kidnapped by Israeli secret service agents from Rome, drugged, trussed like an "african slave", chained to a crate on a cargo ship and brought to Israel. He was reviled in the Israeli press as "the greatest traitor of the 20th Century," a homosexual, an exhibitionist, unbalanced and a general 'loser'. On several occasions even his family members were attacked and humiliated.

This book is not so much a story of Vanunu and how he got access to Israeli nuclear secrets, not even about the secrets themselves. One wishes it were! Alas, despite Vanunu's heroic efforts there are many puzzles still left But rather, it is an extremely well researched book about the policies of nuclear ambiguity that Israel has pursued with total amorality for long. It is therefore, of some special interest to readers in India. For India too — the land of non-violence and satyagraha, is an old adept at playing this game of "keeping the nuclear option open". (So, for that matter, is Pakistan).

The book also contains an extremely interesting appendix — which details the evidence for a low yield atomic blast on September 22, 1979 somewhere in the Indian ocean. It was believed at the time that the event was indeed an atomic explosion carried out jointly by Israel and South Africa, but a later report discounted this explanation.

The book lacks an index and this detracts from its otherwise fine quality. An important contribution to the understanding of the dangerous cauldron that is the Middle East

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An Open Letter

My principal message is in several spheres. The individual; citizen, wherever he lives, has to find a way on the personal level to add his contribution to improve the quality of life on earth, to make everyday life pleasant and more tolerable. Much can be accomplished, starting with what the society offers. If, for example, a person can contribute in the sphere of social equality, by working against discrimination due to race, religion or sex, such a person can earn respect and is worthy of emulation. In my. own case, I wanted to expand awareness the nuclear danger in my own country, Israel, and in the Middle East. And I believe that my action contributed to the security and brotherhood of nations.

I showed by my action that the individual still has power, regardless of the almost unlimited resources of the establishment. Indeed, individual action can be a mighty weapon. Through action the individual can hold the establishment accountable. By means of civil disobedience he can expose the dark machinations of any regime, for the sake of the general welfare. Because governments cannot operate without the cooperation of their citizens, civil disobedience will be discovered by many more people to be the mighty weapon it truly is. An action like mine teaches people to trust their own God-given intelligence. An action like mine demonstrates that people must not blindly follow their leaders on crucial issues involving nuclear weapons. Indeed, if there ever was a case for civil disobedience, it is this.

The nuclear threat is relatively new and has not yet been sufficiently comprehended in the world. Most people are simply unaware of the tremendous volcano under them. Should that volcano erupt, there will be no way back for mankind. It will be the end. And this threat, this holocaust, which hangs over us is all too possible, because of human frailty and error — as was shown by Chernobyl.

In the West, people have grown accustomed to living with the nuclear menace, without realizing the magnitude of the danger, and without conscious awareness of the real possibility that nightmare could actually happen. Not only have the superpowers sanctioned the intolerable presence of large quantities of nuclear weapons, the fact is that many nations in the Third World are following in their footsteps, without regard to the dangers.

To do what I did I had first to overcome many personal obstacles. Most important among these was the exposure of my private life to slander and the sacrifice of all my future plans. 1 had to overcome the force of general public opinion around me, especially of those held up as wise. I also had to overcome the views of intellectuals and experts who worked with me at Dimona. I had to say to them "It is you who are mistaken. It is you who are on the wrong path. On this matter, it is I who know better." And i remain certain that my action was worth the sacrifices I had to make, since I was able to point out - consistent with my own philosophy - what must be done in the name of mankind.

To act as I did undermines the blind confidence in the leaders. We saw an example of this problem of blind trust during Israel's invasion of Lebanon. At that time a majority of Supported the war without doubting it — yet today the situation is exactly reversed. Today most people know that it was not a defensive war — but folly. Today most people know that it was simply a bloodletting to bring about by force the so-called "new order" in Lebanon. Yet because Israelis followed their leaders blindly during that war, many civilians and even children were executed in cold blood. I knew the truth from the war's first day. I knew it was going to be one more example of slaughter. I don't know how I knew, but I did. I simply would not believe the stories and announcements of the Israeli government. Because of those events, I began to take a more critical look at Israel's nuclear programme.

Today I am convinced of the great danger posed by Israel's nuclear policies. Today the government still does not even admit the existence of nuclear arms in the country. They hint at their existence, yet they refuse to allow international inspection of the Dimona reactor. Because the citizenry here is not informed, people are unable to work in a coordinated way to prevent the disaster which may lie ahead. The danger is that in a future crisis, Israel's leaders will be influenced by unreliable information, or will mistake a false threat for a real one, and so will trigger off a nuclear holocaust.

Today nuclear weapons are principally designed for use against civilian populations. A single bomb exploded over a modern city can kill hundreds of thousands of its citizens. Nor does the tragedy end there. Long afterwards, contaminating fallout radiation can make whole regions uninhabitable for many years. In addition, as was demonstrated at Hiroshima and Nagasaki, thousands of people will continue to die from cancer for years after the explosion. Moreover, it must be understood that since Hiroshima the dangers have increased because the destructive power of today's bombs is many times greater. The number of these weapons have reached terrifying levels. It is no wonder the Soviets and the Americans are seeking to eliminate some missiles from the European theater. Yet, from the standpoint of the individual, the best way to effect protection is to study the problem. Only by learning more about the danger can one hope to organize effective prevention.

A society unable to recognize the nuclear danger, a society that fails to take the step[s necessary for survival, is a sick society. Indeed, the best evidence of this fact is the dark cloud, the menace, the warning signs which continue to hang over us. But there are other risks as well. A people that chooses to go on living in daily ignorance of such a threat develops other social and psychological problems which are greatly damaging in and of themselves - without a bomb ever going off. Hence, it is not just the deployment of nuclear weapons, but their very existence, which threatens mankind.

Mordechai Vanunu
Ashkelon Prison, Jerusalem
July 1987

Rhapsodie in Blue

STERILITY PROBLEMS BEDEVIL THE FAST BREEDER

The whole nuclear programme in India is based on a fantastic hope. The fast breeder must work. (Fast breeder reactors are a new kind of reactors which are supposed to produce (breed) more plutonium than the uranium fuel they consume. Fast, refers not to the speed of breeding - which is fairly slow, - but to the speed of neutrons which cause fission). And it must work, not on a tidily little laboratory scale but on large 'commercial' scale. The reason it must, is because our uranium resources are strictly limited. (In fact, but for us and a few other aspiring 'regional powers,' nobody in the rest of the world even looks at such poor quality ores. And even these are getting rapidly exhausted. So, unless the breeder can assure us of 'unlimited' plutonium in the future, all the brave words like self-reliance and energy independence would remain mere words. Now, one might wonder why this bother about self-reliance when we manage very well with foreign collaboration in such esoteric fields as soaps and toothpastes! However, these industries do not produce material that can be used for making nuclear bombs. Fast breeder reactors do. However, the only guys who have built a commercial scale breeder, are the French. Their programme is a colossal financial disaster — but that is another story. The following report, which appeared under the headline: Ailing Nuclear Reactor Beyond Salvage in The Sunday Observer of December 9, 1990, gives details of the technical snags affecting the Fast Breeder Test Reactor (FBTR) situated at Kalpakkam.

India's ambitious fast breeder nuclear programme has come to a grinding halt with the 40 MW fast FBTR becoming permanently unoperational. With this, the plan of setting up a 500 MW fast breeder prototype of the Kalpakkam type reactor has fallen through.

According to the Department of Atomic Energy (DAE) sources, the Kalpakkam FBTR has never been operational except for a few minutes on October 18, 1985 when it produced enough power to light a 200 watt bulb.

Immediately after the much publicized commissioning of the plant, it was shut down. It was then reported that the operating level of the plant would be slightly increased. But now, after five years, that remains a pipe dream.

According to DAE sources, the Kalpakkam FBTR had to be closed down because it was ill-equipped to run at a higher power or for more than those few publicized minutes.

DAE circles further claimed that there were several instances of "one minute criticality" before it completely collapsed. They attribute this to some basic flaws in the design of the reactor. Senior scientists working on the project allege that the design of the entire steam generation unit was done "independently" of the reactor design, and there were crucial variations between the two. The steam generation unit, they alleged, was not built according to given specifications.

To top it all, in the hurry to stay on course with the given goal of generating 10,000 MW through nuclear power by the turn of the century, the reactor was made critical even before the design anomalies were rectified. The result was that the sub-assembly unit of the core of the reactor, called the calandria was damaged. It is yet to be rectified.

In a reactor of this design, the control rods, (called the guide tubes) and fuel rods of enriched uranium are placed alternately. In the FBTR they became intertwined, each obstructing the other's passage, thus rendering the reactor static. This is a unique problem which has no precedent, say DAE sources.

Serious radiation threat to the technicians stands in the way of rectifying the damage. The high radioactivity permits only intermittent access to the reactor and make it extremely difficult to adopt any hands-on approach in solving the problems. Due to premature criticality, even the simplest maintenance tasks are rendered complicated and long drawn out.

A recent proof of this was a circular put up on the notice board at Kalpakkam which congratulated the technicians on successfully disentangling the reactor guide tubes. But contrary to what the circular states, sources in Kalpakkam allege that the guide tubes have not been disentangled and are still within the core of the reactor.

The flaws in the guide tube assembly have stalled the insertion of fuel rods into the reactor core or its removal. This could lead to a serious accident if the reactor was "on power". Compounding the difficulties in undertaking the repairs is the lack of know-how in any part of the world.

In a desperate move to salvage the fast breeder programme, the DAE imported and used parts of the junked French reactor *Rhapsodie,* on which the Indian breeder is modeled. French nuclear experts are of the opinion that the components of *Rhapsodie* - which was primarily a private design decommissioned several years ago - were so dysfunctional that they would not fit the bill as far as the Kalpakkam project was concerned.

In fact, while providing the components France made it clear, according to DAE circles, that it would give no performance guarantee in the event of the DAE attempting to retrofit and use them in the FBTR.

But now. with new nuclear tie-ups being envisaged with France, attempts to import components and somehow salvage the project are going on at desperate speed. This is supported by the projected expenditure allocation of Rs.36.62 crores for the Indira Gandhi Centre for Atomic Research (IGCAR).

Senior engineers and scientist are, however, firmly of the view that the project cannot be salvaged at any cost. They are also very critical of the DAE's decision to go ahead with the design of the 500 MW prototype fast breeder reactor.

Dr.Paranjeepe, director of the IGCAR flatly refused to give any Information on the working of the fast breeder project. He just kept asserting that the information gathered by the journalist were "unauthentic" and "unsubstantiated."

Dr.Paranjeepe however, reluctantly admitted that there were "some minor problems" in the FBTR, which would be rectified in the "near future." He refused to divulge the specific nature of the problem.

The scientists at the IGCAR do not rule out the possibility of an accident, as they feel that the radioactivity of the fuel rods may trigger off a fusion process before they are removed from the core, which may be uncontrollable. They are, however not prepared to reveal the real threat, constrained as they are under the Atomic Energy Act 1962, which forbids them from revealing any classified information. Yet they maintain that the chances of Kalpakkam becoming another Hiroshima are higher than it becoming another Chernobyl.

Zebra Mussels Take on Nukes

Zebra mussles are smelly, calm-like parasites which grow to approximately three centimetres in length. As unimpressive as they may appear, these creatures have a lot of people in the Great Lakes basin of North America scrambling for a way to kill them off. Experts believe that these organisms came to Great Lakes in the ballast water of foreign ships, in a new development, a US scientist has discovered that potassium is lethal to the mussels. Potassium is a cheaper and less environmentally harmful alternative to chlorine, ozonation or hot water.

Originally from the Black Sea, Zebra Mussels were first noticed in Lake St. Clair in 1988. By 1989 they had infested Lake St. Clair and Lake Erie, and by March 1990, they had spread to parts of the other lakes and rivers in the system. Adult Zebra Mussels have also been found at the Bruce Nuclear Generating Station on Lake Huron.

The larvae attach themselves to hard surfaces at densities of upto 700,000 organisms per square metre. Once they mature, a thick, hard coating of adult mussels cover the surface. Consequently they have significantly reduced the flow into several municipal, power plant and industrial water intake pipes in both Ontario, Canada and U.S.

Nuclear power station operators in the US have repeatedly experienced "biofouling" problems over the last decade. The Nuclear Regulatory Commission (NRC) Information Notice # 89-76, to all operators of nuclear power reactors, identifies Asiatic Clams, American Oysters, Blue Mussels and Zebra Mussels as species of particular concern. This notice outlines regulations for prevention of biofouling and states that "the potential for biofouling has been of concern to the NRC since 1980 because biofouling can compromise the vital transfer of heat to the ultimate heat sink." In other words, Zebra Mussels have great potential for plugging cooling systems. Zebra Mussels have given us yet another reason to move away from dependence on large, centralized generating stations.

Rod MacLeod
Nuclear Awareness News Summer/Fall 1990

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Editor: Surendra Gadekar
Subscriptions, donations, manuscripts, enquiries regarding circulation, etc. should all be addressed to:
Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA
Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at Parijat

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ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 4 **February/March 1991**

if I fail
to work the horror
into a play
of voices in which the living and the dead
live again

who will forgive me

. Marc Kaminsky

The Road From Hiroshima

The United States' government often considers itself the world's policeman. And, like the police in most parts, it conducts itself in a manner as if it was above the laws which govern civilized behaviour.

Forty five years ago, US brought nuclear misery upon the world by being the first and so far the only nation which has used an atomic weapon on another. It was an event that shocked everybody. An American poet, Marc Kaminsky, puts it rather well

Whatever you hear
about Hiroshima
whatever wild stories you hear

all of it happened.

Last month US again crossed the line. This has been done with so much impunity and with so little outrage and condemnation from the rest of the world that one shudders to think of what life is going to be like in the "new international order" that is to follow this carnage in the Gulf. The bland, almost aseptic statement, "Iraq's nuclear capability has been destroyed" hides an enormous crime. What has been done is the bombing of an operating nuclear reactor and the willful spread of radioactive pollution. Cleaning up this mess, once the war ends, is going to be a difficult task and one which will contaminate many more people. Even Israel - a country whose government has often in the past acted in a high-handed manner - has never committed such an atrocity. The bombing of Iraq's Osirak reactor by Israel in 1981 and later by Iran during the Iran-Iraq war was done at a time when the reactor was not operational and did not contain radioactive poisons.

Iraq is a signatory to the Nuclear Non-Proliferation Treaty (NPT), and its nuclear facilities are thus subject to inspection by the International Atomic Energy Agency (IAEA). The last IAEA inspection of Iraqi facilities was carried out in November 1990 and provided no indication that Iraq was in the process of building nuclear weapons. Thus, the bombing of these facilities besides setting a new and altogether dangerous precedent also tells the rest of the world that NPT is not worth the paper it is written on, and that powerful countries have no faith in the process of international inspection. The fact that the bombing took place just after the ratification by the Soviet Union and Western countries of the first addition to the Geneva agreement of 1949 prohibiting attack on nuclear installations in wartime, just makes the act doubly shameful

Second World War documents indicate that Hiroshima was not the last event of that war but the first event of the Cold War — its real purpose (contrary to much advertised claims) was not so much the destruction of the Japanese will to pursue war as much as to intimidate the Russians and other allies of US with a demonstration of American military might. Then too, a new post war world order was just emerging and the US wanted to show that it would brook no questioning of its "God" given supremacy. If in the process, Japanese women and children and their children were to be consigned to atomic hell—well, they were only Japs. The brutality showed in the wanton destruction of Iraq displays a similar disregard for the sanctity of human life.

Saying all this in no way constitutes approval for the actions of Saddam Hussain. He too has been an international thug! His use of chemical weapons against Iran and even worse against his own Kurdish minority was a gross violation of the norms of civilized behaviour. There can be no doubt that he needed to be effectively curbed; but it is not for those who armed him and were responsible in allowing him to become a monster to now crush him through recourse to even more heinous actions directed against the people of Iraq.

What are the implications to us of a world where nuclear reactors are considered "fair-game" during wartime. We have a large number of nuclear facilities located all over the country each of which is now a greater threat to the surrounding environment and the populace. Unlike the Iraqi reactors which were small in size, our power reactors are huge by comparison and contain much larger amounts of radioactive poisons. Nucleocrat would contend that they are protected by "double containments" — thick steel lined concrete wails which can presumably withstand earthquakes and enemy attacks. However, as the Israeli demolition of Iraq's Osirak reactor in 1981 showed, this assurance is as worthless as other nucleo-assertions. Even if one were to grant it to be true, no concrete walls protect the spent fuel storage pools adjacent to the reactors and if a bomb were to land in one of those, it would be a major catastrophe. In this connection special mention must be made of the hazards posed by the research reactors at Bombay. Though they are smaller in size, they none-the-less contain significant radioactive toxins and are moreover located in an extremely densely populated area. Thus any dispersal of radioactivity would immediately affect a large number of people. The only comforting thought in all this is the ratification by India and Pakistan of an agreement to not attack each others nuclear facilities. But then, in today's world, agreements are made on paper and not in the minds of the people.

Today, we are again on the verge of a new world order. The Cold War has ended. "Evil Empire" is breaking into pieces. But are the Americans - the self proclaimed good guys, not empire builders? Is their proposed new order something that any self respecting individual or nation can subscribe to? It behoves the mighty to act with justice and compassion. The present leadership in America has shown that it is untouched by either. Truly all the wild stories you may hear of Hiroshima, happened. They are happening still.

Surendra Gadekar

An Everyday Affair

Forty spent nuclear fuel elements have arrived for reprocessing at the Dounrey reprocessing facility in Scotland. The fuel rods were transported from a research reactor in India by a normal cargo ship and passed through the Gulf area. Dounrey authorities claimed that they had done so before the Gulf war began.

The fuel was supplied to India during the 1960s, and has now been returned at the end of the contract period. Dounrey is not releasing all the details of the transport but the authorities there have confirmed that it was carried in a normal cargo ship and not in a ship purpose-built for handling dangerous highly radioactive cargo.

'1 find it hard to believe that they could have been so irresponsible. Why could they not have waited a few months? After all the fuel has been in India for nearly 30 years. And why could they not have completely avoided the Gulf and instructed the ship to go around Africa?" said Chris Bunyan of the Northern European Nuclear Information Group. He added that it was irresponsible to transport such dangerous cargo - of nuclear weapons grade material - anywhere near the Gulf even before the war started, but to have transported it using an ordinary cargo ship just adds to that irresponsibility.

Source: WISE News Communique No 346

UNALLAYED FEARS

The greatest dilemma which the nuclear establishment in the country has encountered has been: whether to abandon a crippled nuclear reactor or to salvage it by yet to be proven technology exposing workers to high doses of radiation. That, in short, is the story of the Rajasthan Atomic Power Project's first unit (RAPP-1).

It is three years since the Nuclear Power Corporation (NPC) submitted its report to the Department of Atomic Energy (DAE), outlining the extent of damage to, and recommending the replacement of an endshield of the RAPP 1. The endshields at each end of the reactorvessel serve as protection against radiation and high temperature, besides providing support to the coolant tubes. The cylinder shaped reactor vessel houses 306 calandria tubes. In every calandria tube is lodged a coolant tube, each of which comprises 12 uranium bundles. Heavy water flowing through these tubes carries the heat generated in the reactor to the boilers.

DAE Apathy

At RAPP-1, a paucity of funds, coupled with a lack of advanced technology and the general apathy of the DAE have led to undue delays in undertaking the rehabilitation of the crippled unit. Though aware of the dire consequences of such delay, the country's nuclear power authorities seem to have done little about it. A bigger crack in the end shield may result in the leakage of light water leading to a loss of coolant phenomenon and a consequent catastrophe.

Thete are two kinds of costs involved in running a crippled unit. One is the increased risk of a disaster. This cost one has to pay if and only if a disaster strikes. But if there is a major accident, the cost as shown by Chernobyl would be crippling. But there is also another cost involved - one *which moreover, one has to pay in any case. This is the Increased radioactive burden on the surroundings. The more radioactive the structure, the higher it is going to cost to decommission it and store the wastes, both in terms of money as well as in terms of the radioactive burden on the workers. Thus many utilities abroad find it cheaper to shut down old reactors rather than to continue running them at reduced output and to pay astronomical decommisioning costs later.*

The precursor of NPC, the Nuclear Power Board, had submitted a preliminary report on the damaged unit in 1986. In early 1988, NPC made a detailed report supporting the proposal for replacement of the south endshield. The estimated cost of removing the damaged endshield and installinga new one was pegged at Rs. 50 crore. Having received the report,, DAE forwarded the same to Atomic Energy Regulatory Board (AERB) to oversee safety requirements for undertaking the task. The DAE, however is yet is yet to sanction the amount.

The cracks on the south endshield were first noticed as early as September 20, 1981. They were discovered by the by the scientists when the reactor was brought from Canada in parts and assembled here. The defective portion had then been repaired by welding, but 'stress relieving' could not be carried out due to the absence of the necessary facilities at the site then.

Damaged Reactor

During reactor operations, cracks appeared around the affected area due to the effect of high neutron radiation. The cracks have resulted in a leakage of light water which the NPB report considered a serious incident, likely to result in possible defects. Mechanical means havingbeen used to plug cracks, there are apprehensions that the workmen involved in the operation may have been exposed to high levels of radiation.

Preoccupied as it is with the generation of power, the DAE has been unable to allay the fear of exposure. It took four and half years to plug the cracks and the unit started producing electricity after receiving a clearance from the safety committee which approved of the repairs.

RAPP-1 has in effect been used as a prototype by nuclear technologists. First, they were in such a great hurry for bringing the benefits of nuclear power to India that they went in for a full fledged plant without acquiring any experience with a small sized prototype. Then, when its performance turned out to be a total flop, all they did was to perform a semantic trick — they decided to call it a prototype. The problems encountered were not only with the conventional parts of the system like the turbine as mentioned in the artivcle but with everything imaginable — large leakages of heavy water and an inability to make heavy water within the country; (this /ed to adoption of unconventional and hazardous operating procedures); unavailability of spare parts, troubles with the grid; labour problems; troubles with the emergency core cooling system; cracks in the endshield; what have you- the list is endless

The reactor tripped again on May 20, 1985. Cause: the cracks which had been repaired had widened. The safety committee put its foot down and advised a permanent shut down of the unit which it believed could not be repaired. But the DAE prevailed over the safety committee and by developing an advanced technique of chemical plugging, succeeded in plugging the cracks.

The repaired unit was once again synchronized with the grid on February 29,1988. The repairs cost Rs. 1.2 crores. However, the cracks and consequent repairs had taken their toll - from an installed capacity of 220 MW, the unit is currently being run at 90 MW.

Ever since it was commissioned, RAPP-1 has been a problem unit. Plagued by frequent tripping, its overall performance has been rather poor because of grid problems, and difficulties arising from the use of conventional equipment like the turbine.

The frequent tripping of the reactor is traced to a fundamental error that was apparently made during the planningand design of the reactor. In the absence of data with regard to the water temperature from the Rana Pratap Sagar Lake, on whose banks RAPP is situated, the Canadian contractor's designed the plant according to the lake temperatures prevailing in their country. The temperature of the lake was taken to be 21 degrees centigrade, though later it emerged that the lake's temperature was around 31 C. Thus the units will never be able to achieve the 220 MW capacity and can at best generate only 198 MW of electricity, the DAE's claims of having achieved the installed capacity generation notwithstanding.

This excuse is really the limit. Pray, how difficult it Is to obtain data regarding a lake's temperature? The Canadians obviously designed reactors to suit their own conditions. When we decided to Import their technology, they were obviously not going to redesign the plant just to suit us. It was our need and the onus was on us to do the redesigning. We preferred to borrow their design wholesale without a thought regarding our conditions. We deserved what we got - a substandard machine and plenty of headaches.

Moreover, the reactor has tripped 300 times till date, weakening the system which has not been insulated against such thermal shocks. It takes 36 hours to restart the nuclear power station after tripping.

If the NPC's technical report is accepted along with AERB rider for safety requirements, unit -1 will have to be shut down for at least four years to facilitate the removal and subsequent erection of a stainless steel endshield.

Post-facto Prototype

Experts feel that the removal of the endshield is technically feasible. But the question engaging the minds of engineers whether such an exercise will be possible given the limited space within the reactor building, and the proximity of the endshield to the reactor vessel which has a radiation level of 100 Roentgens per hour.

Though the Bhabha Atomic Research Centre has the expertise for remote controlled handling of equipment exposed to radiation, it has not been put to industrial use yet. An expert states that "the present technology is limited to the changing of fuel bundles alone, and no one has yet conceived the possibility of changing the endshields nor initiated work in this regard."

DAE asserts that the job has to be necessarily undertaken in view of the similar designs of three other plants: RAPP-2 and both units of Madras Atomic Power Station (MAPS). "Rather than write off the crippled unit, it is economical to go in for repairs as it would provide us the technical competence and expertise to handle such jobs in the future," observes a NPC official.

Officials of the AERB, however, feel that in the event of an emergency, the shut down will be hurried and safety precautions will not be taken. Nuclear Power Corporation oblivious of future catastrophe, is keeping the unit running, for fear that a power shortage in the state may evoke adverse public reactions. "NPC is likely to continue underestimating the problem until more cracks appear," an AERB official remarked.

The sad part of this prototype saga is the fact that it is the poor innocent children of the surrounding villages who have had to pay the real costs of training nuclear technologists In the form of Illnesses and tumours. (See "Chernobhata" In Anumukti Vol.4 No.1)

NPC managing director S.L.Katti has admitted that the DAE will be approached for funds to undertake the repairs. A major portion of NPC's activities is funded by the DAE. In 1988-89 it received over 80 per cent of Rs 1459.15 crore from DAE.

Unsolved Mess

Katti stated that the job of removing the endshield could be undertaken only when the coolant channels are removed the next time which will be four to five years from now. He was emphatic that there were no immediate plans to take up the job also because proper remote tooling to handle such an operation was yet to be developed. "BARC has developed and tested remote tooling to handle other hazardous operations which could be helpful indevelopingspecialized toolingneeded for our job," he said.

Admitting that it was uneconomical to continue to run RAPP-1 at 85 MW, Katti indicated that the Rajasthan State Electricity Board is likely to be approached soon with a proposal for a hike in power rates. "If they do not approve of the hike, they may have to do without power from our plant," he said.

Rather than admit the non-availability of funds and technology to undertake the changing of the endshield, the DAE consistently makes statements to the effect that "repair works of the kind never undertaken anywhere in the world are in progress."

Successive DAE secretary's from Dr Raja Ramanna to Dr M R Srinivasan in order to wiggle out of the mess have time and again stated that RAPP -1 was an imported reactor which was still to be commissioned by the exporting country itself. It may be pertinent to point out that the Douglas Point reactor in Canada (on whose design RAPP was based) developed similar problems and was prematurely shut down.

If RAPP-1 was a prototype whose performance had not been assessed, why did the DAE rush ahead with commissioning other similar reactors in the country such as RAPP-2 and both units of MAPS, without first evaluating its performance? The nuclear lobby is unwilling to answer this.

SOURCE: Kumar Basu in The Independent February 20, 1991.

Keep Taking the Tablets in Case of Mishap

Amid rising fears about the safety of one of Central Europe's biggest atomic power plants, pharmacies in Austria and Czechoslovakia are to distribute potassium iodide tablets to help protect their populations in event of a nuclear accident.

The Austrian health ministry said the tablets,a precaution against radiation-induced thyroid cancer, would be made available free of charge in the next few days to children, pregnant women and nursing mothers. Czechoslovakia has already begun providing the pills within a 20 mile radius of the nuclear power station at Jaslovske Bohunice in Southern Slovakia. The thyroid absorbs iodine from the tablets and becomes saturated thus preventing further absorption of radioactive iodine from any accidental release.

An Austrian government commission concluded last month that unsafe conditions at the plant, 35 miles across the republic's northern border, threatened a new Chernobyl-like disaster. Austria's socialist chancellor, Franz Vranitzky, responded to the report by demanding that Prague shut down the plant, which uses Soviet made pressurised water reactors of the WER-440 type. (Quite similar in design to the one's now planned at Koodankulam in Tamilnadu — Editor). He offered provisional deliveries of free electricity to Czechoslovakia to make up for the power lost by a shutdown, and has called for a Central European zone free of nuclear power stations.

A fire at Bohunice on 15 January and another six days later at Czechoslovakia's second nuclear power station at Dukovany has increased Austrian fears about its neighbour's reliance on atomic energy. No one was injured in the fires and the Czech authorities say that there was no release of radioactivity

Austrian economics minister Wolfgang Schussel said that the compensatory supply of power to Czechoslovakia would cost $330 million per year. Austrian power plants were capable of filling in for Bohunice "with some effort, " Schussel added.

While a 1978 public referendum banned the use of nuclear power stations in Austria, Czechoslovakia depends on them for a quarter of its electricity. International pressure to cut this comes at a time of rising economic difficulties in the transition to a market economy.

The Czechoslovak government acknowledged last year that the Bohunice plant did not meet international safety standards. However, it says that it has been advised by the West German company, Seimens and Westinghouse of the US that the plant can be modernized and remain in operation.

Austria's offer to supply alternative electricity has so far met with scepticism among officials in Prague.

Michael Wise in The Independent - London

SKYROCKETING NUCLEAR COSTS

Since 1980, the construction cost for nuclear plants in the US has increased four-fold, while operating and maintenance costs for existing plants increased more than 10% annually, despite extensive government support. Proposed new nuclear power plant designs have serious safety shortcomings and would be among the most expensive options for producing electricity. *-WISE NEWS COMMUNIQUE 344*

Chernobyl Reactor's Next of Kin

Below we reproduce a letter written by nine environmental organisations in Canada to The Canadian Prime Minister urging him to reject a loan application from Romania to complete construction of five nuclear power reactors at Cernavoda. We are doing this because firstly we strongly endorse the sentiments expressed in the letter and secondly also because India too has gone in a big way for CANDU type reactors and many of the observations contained in the letter are of relevance to us.

We are writing to oppose the proposed extension of the loan for building Candu reactors at Cernavoda, Romania. We call upon all members of the House of Commons to refuse further funding for the project.

Nuclear power is dangerous, expensive and unnecessary wherever it is proposed or tried. Romania is no exception, and the lack of democratic mechanisms in the country make nuclear power an especially risky venture.

Nuclear power is dangerous, and may be more so in Romania. One concern is the nuclear weapons connection. Ceausescu boasted that with the Candu, he also had atomic bomb capability, and the regime that replaced him may have similar intention.Every Candu customer thus far—India, Pakistan, Argentina, Korea — either has the bomb or is reported to be working towards it.

Another threat is the possibility of a major accident such as the one at Chernobyl. The ingredients that caused the accident at Chernobyl — design flaws, operator errors and situational circumstances — all have parallels at Cernavoda.

- The Candu shares a design flaw with the Chernobyl reactor - a flaw that was a major contributor to the accident. The flaw, known to nuclear engineers as a positive void coefficient, causes the reactor to accelerate in the event of cooling failures. Massachusettes Institute of Technology's *Technology Review* magazine (July 1989:50) described the CANDU as the "closest operating relative"to the Chernobyl reactor on the basis of this shared design fault.

- Labour problems at the Cernavoda plant may already have jeopardized safety. A CANDU reactor operating in Romania will have to contend with a relatively unskilled labour force in both its construction standards, and with what appears to be conscripts still working at the site against their will, the possibilities for accidents by neglect or sabotage are enormous. Recently released documents indicate that Atomic Energy of Canada Ltd was forewarned of the problem with forced labour and poor construction work, but proceeded with construction and was unable or unwilling to prevent the problems from occurring.

- The technological infrastructure and services (evacuation plans and medical expertise, for example) are not likely to be better in Romania than they were in Ukraine. We have no reason to believe that the Romanian government will be more accountable to its people than was the Soviet government: it took days for Moscow to admit that there had been an accident at Chernobyl, and even four years after the accident, local populations are still being moved from the accident area — people were unnecessarily exposed and this could happen again at Cernavoda.

At a time when powers were being devolved from the central dictatorship in the Soviet Union to local and state governments, the people living near the Chernobyl reactors were finally able to do what they have wanted to do for years - shut them down. The Ukranian legislature has moved to close the last of the Chernobyl reactors by the end of this year. Had this movement towards democracy been made five years ago, the world might have been spared the legacy of radioactive pollution that Chernobyl wrought.

People all over the world, when given a chance, usually say "no" to nuclear power. Referendums in Italy, Switzerland, Sweden, Austria and California have led to moratoriums on nuclear power development and, in most cases, the premature closure of operative reactors. Upon supplanting totalitarian regimes, democratic governments in Poland and Philippines ended their country's' nuclear power programmes. Since the advent of Perestroika in the East Block, people have used their new found access to information and freedom of protest to launch a passionate and effective antinuclear movement: over 55 nuclear facilities have been closed or canceled in the East Block since the accident at Chernobyl.

Romanians do not have the opportunity to say "no". The Romanian people have neither been in-

volved in the decision to develop nuclear power nor duly informed of its risks. There is much evidence to suggest that the Romanian government is till abusing human rights and is unaccountable to its people. Canada should not be a party to the Romanian government's efforts to foist such a dangerous and unnecessary technology upon the people of that country.

That romania is experiencing a severe shortage of power is undeniable: new supplies of electricity must be found and existing supplies must be more efficiently used and more fairly allocated. However, environment and society are sure to suffer if decisions regarding the provision of power are made without public participation. Intelligent decisions regarding development and the environment cannot be made in isolation from the crucial checks and balances that come with public scrutiny.

Romania should be able to meet its need for electricity with a mix of efficiency improvements, co-generation and other small renewable energy technologies: therefore nuclear power is unnecessary. We, therefore call upon the government to cancel further consideration of this loan.

Contact Address and letters of support to:
Norman Rubin, Energy Probe
225 Brunswick Avenue Toronto
Canada M5G 1L5

The Glare of Public Scrutiny

N *Nucleocrats all over the world lie so often that it should come as no surprise that they sometimes get caught. We have often in the past referred to the fact that the stated nuclear costs bear no relationship to reality. Thus the statement, often made for the sake of comparison with coal fired plants, that reactor A has been producing electricity at x paiseper unit, properly belongs to a work of fiction. The following article is significant for two reasons. Firstly, it is the report of an official committee and secondly because it appeared in* ***ATOM:*** *the journal of the United Kingdom Atomic Energy Authority. It was, characteristically hidden on page 29 of the October 1990 issue under the heading:*

House of Commons

Energy Committee Report: The cost of nuclear power

The Energy Select Committee under the chairmanship of Dr Michael Clark has published its fourth report, 'The costs of nuclear power" The committee states that:
'The purpose of our enquiry was not only to examine the reasons for the perceived increase in the cost of nuclear power, but to discover why, despite this Committee's warning, the government did not recognize more quickly the level of costs, and why it embarked on a policy of privatising nuclear power which the high cost and substantial risks of nuclear power eventually forced it to abandon."

"Nuclear power has long been presented by the government and electricity utilities as cheaper or potentially cheaper, than other forms of generation. The Central Electricity Generating Board (CEGB) in 1988 informed the Hinkley Point C public inquiry that the "economic resource cost" of the proposed Pressurised Water Reactor would be 2.24 pence/kWh, less than for coal fired generation (at 2.50 to 2.62 p/kWh, depending on whether the station was coastal or inland). Yet subsequent nuclear costing have been considerably higher than those for fossil-fired generation. National Power later put the lifetime "private sector price" of PWR generation (calculated on a different basis) at 6.25 p/kWh whereas it suggest that the same for fossil-fuel fired plant would be between 2 to 3 p/kWh.

The Committee summarized its main conclusions as follows:

- Different rates of return in the public and private sectors for investments involving similar risk are an invitation to misallocate resources by spending money on relatively high risk, low return public projects, and the CEGB and the Department took too little account of the risks borne in the public sector.

- *We reject the belief* of CEGB and the Department *that different assumptions* as to availability and other uncertainties *should be made according to whether a project is in the public or private sector.*

- *We reject the view* of CEGB and the Department *that the cost of electricity from a reactor could be almost doubled* by priva-tisation, and we are *profoundly concerned that* the *CEGB should have put a low figure to a public inquiry* in support of the case for a major public investment *and one almost twice as high shortly afterwards* for power from the same reactor in the private sector.

- The transfer of risks from utilities to the consumer or the government *has constituted an unacknowledged and major subsidy over the years to nuclear power.*

- We are convinced that there has been *a systematic bias* in CEGB costing *in favour of nuclear power,* both in ignoring the risk and failing to provide adequately for contingencies, and, in respect of investment, in putting forward 'best expectations' rather than more cautious estimates.

The Committee recommended :

- The Department of Energy and the regulator should publish comprehensive information on how the fossil fuel levy (which subsidizes at present the nuclear electricity generation in UK) is set and the reasons for any changes.

- As a matter of urgency, the Department of Energy should estimate as accurately as possible the costs of completing and operating Sizewell B during its intended life compared with the costs of canceling it and generating the same power from other sources; and in so far as continuation is justified by non-economic benefits, comparison should be made with the cost of alternative ways of achieving those benefits. The Department should publish the estimate, explaining how it was calculated.

  Any costs involved in extending the lives of magnox reactors should be fully and publicly accounted for, using a rate of return on avoidable costs comparable to that of other forms of electricity generation and removing any distortion caused by the fixed element in British Nuclear Fuels Ltd's charges.

- *It is essential that if further nuclear investment is justified in 1994 on grounds of diversity of supply or reduced pollution, the economics of nuclear power are in no way glossed over, that the full costs and risks of nuclear power are ascertained as closely as possible, and that the analysis is fully exposed.*

From Hiroshima to Rokkasho

In Gujarati, Rokkasho means asking for a halt. For a while it looked as if this tiny village in Aomori prefecture on the northern tip of the main Japanese island would really live up to its Gujarati meaning, and bring to a halt the Japanese nuclear expansion programme. Unfortunately, the victory of the pro-nuclear Masaya Kitamura, in the election to the governership of Aomori prefecture, due to the division of the antinuclear vote amongst two candidates who together polled some 100,000 votes more than him, has given a new lease of life to one of the biggest programmed assaults on the environment anywhere in the world.

Engine of Nuclear Industry

Japan is one of the leading industrialized nations. However, it is very poor in energy sources and has to import most of its energy in the form of oil, coal, and uranium. Thus the appeal of an indigenous energy source, independent of the vagaries of world politics, is very strong to the bureaucrats and industrialists who run Japan. They view the growing pile of nuclear waste from reactors, as their very own plutonium mine. Presently 30 percent of Japan's electricity comes from nuclear sources. The plan is to raise this to 40 per cent within the next two decades, based primarily on plutonium.

This continuing drive towards nuclear is what makes Japan unique amongst OECD countries. In all other rich, industrialized nations nuclear programmes are being wound down. There have been very few new orders for nuclear power stations within these countries. Nuclear industry for survival depends on suckers in the Third World. However, leaders of these nations though eager to traverse the nuclear path don't have the wherewithal to match their sky-high ambitions. Thus, Japan has during the last decade,become the engine of the world nuclear power industry with its demand sustaining technologies in -US and Europe. "There are many lessons to be learnt from Japan by the rest of the world on how to construct and operate nuclear power plants" says Kent Hansen, who chaired a recent US government study on Japan's nuclear policies.

However, the pro-nuclear consensus that made it all possible began to erode following the Chernobyl disaster of 1986. Matters got worse in January 1989 when a damaged pump forced the Tokyo Electric Power Corporation to close down a reactor for nearly two years. A government survey carried out in September last year showed that while two thirds of the Japanese public thought nuclear power was necessary, over 90 per cent had anxieties. A major cause for the anxieties besides the fear of accidents is the fact that Japan has as yet no place to store both the high level as well as low level radioactive waste

Biggest Nuclear Complex

The centre-piece of the Japanese nuclearization policy is the sprawling, ($9.09 billion) nuclear fuel complex to be built at Rokkasho. When completed, the facility, which consists of an uranium enrichment plant, a large reprocessing plant to recover plutonium from spent fuel and a radioactive waste storage center, would be one of the biggest nuclear centres in the world. It should come as no surprise to those conversant with 'development' to know that Rokkasho and indeed the whole of Aomori prefecture is the poorest of Japan's 47 prefectures with the sole exception of Okinawa. The weather is harsh and the infrastructure is patchy. It is also home to other such 'development' projects which the Japanese government considers necessary but undesirable. It is unsuitable as a nuclear site since it is a region of geological instability with high ground water level. A still more ominous feature of the site is that all the facilities will lie under the "specially controlled sky area" of the US and Japanese air-forces since Rokkasho is situated very near to both Misawa air base and Amagamoriair-to-ground gunnery and bombing range. There have been ten aircraft related accidents there in the last five years includingF16 fighter bomber crashes and erroneous dropping of dummy bombs in the surrounding area.

Worried Proliferation Experts

It is not only the local farmers and fishermen who are worried by the Rokkasho complex. Nuclear proliferation experts in the US and Europe are equally worried. The facility, "does not make economic sense and the plutonium glut it creates could be inflammatory at home and abroad, " concluded a recent study by the Science Policy Research Unit at the University of Sussex in Britain.

Presently, Japan' exports almost all its nuclear waste to France and Britain, which have large reprocessing plants of their own. These countries are supposed to extract the plutonium and then ship it back to Japan along with other radioactive garbage produced by the reprocessing Process starting from next year. However, the logistics of this massive radioactive transport is getting complicated. Originally, the plan was to airlift the stuff over the north-pole. That plan has now been discarded since Japan was unable to prove sufficient crash protection. Now, the idea is to start regular shipments of as much as 30 tonnes of plu-tonium over the next decade. Since that is worth thousands of bomb-worth of plutonium protecting these ships from terrorist attacks is going to be a serious problem. Besides, there is an urgent need to store the junk somewhere. Hence the attraction of Rokkasho to Japanese policy makers.

High Level Dump

The Low-Level Radwaste Storage Center where these and other radioactive wastes are to be kept is a misnomer. What it actually denotes is a high level permanent dump. The Atomic Energy Commission of Japan defines low level waste as one that contains no more than 2.5 Curies of radioactivity per ton, whereas at the storage center more than 100 Curies per ton would be permitted. The reason for this high level is that the materials stored in the drums, like used ion-exchange resins, contaminated gloves and clothing are presently incinerated to reduce the total volume of the waste, resulting in a much elevated concentration of radioactivity. Consequently, the radiation level at the surface of a single drum would amount to 1 Roentgen per hour. The plan calls for burying 200,000 of these drums in the initial stage, which would last for a period of ten to fifteen years. During this time, the pit would be open to facilitate burial. Therefore, even under 'normal' conditions, with no accidents local residents would be exposed to this high level of radioactivity.

Plutonium Surplus

The Japanese government and industry have repeatedly asserted that the shipments of plutonium from Europe are necessary if a shortfall in supply of plutonium to research reactors is to be avoided in the early 1990s. However, several studies indicate that this is just not true. A study carried out by J.Takagi and published in the *Bulletin of Atomic Scientists* shows that Japan's stockpile of surplus plutonium will amount to as much as 50 tons by the beginning of the next century — an amount sufficient to produce thousands of atomic bombs. This is a chilling prospect for anyone concerned with nuclear arms proliferation.

The government strategy to cope with this surplus plutonium is to burn it in conventional reactors as MOX (Mixed Oxide Fuel of uranium and plutonium). However, the long term future of this strategy is still in doubt since ever increasing costs of reprocessing coupled with the continued low costs of uranium make this option uneconomical.

Thus, even inside the world nuclear industry, scepticism is growing regarding the rationale for plutonium recycling. Japanese government seems to be quite alone in its willingness to promote the plutonium business. The future of world plutonium Industry now hinges upon the attitude of Japanese nuclear industry.

It is a long way from the suffering of Hiroshima and Nagasaki to being the nuclear engine of the world. The fact that it has been traversed shows that hunger for power is a madness that does not respect geographical boundaries or historical experience.

Nuke Info Tokyo No 20 & 21.

"No" to Jellyfish Babies

Historically, most attention to nuclear issues has focused on the concerns of the rich states of the northern hemisphere, while some of the greatest instances of nuclear pollution have been in the islands of the Pacific.

- Since the Second World War, 238 nuclear bombs have been blasted in the Pacific islands. 14 of the Marshall Islands were made uninhabitable by U.S.testing.
- Between 1946 and 1970, the U.S. dumped 100,000 curies of radioactive waste in Pacific Ocean sites.
- In 1979, Japan announced its intention to dump 10,000 drums filled with low-level radioactive waste at a site north of Marianas Island on an 'experimental' basis.
- In 1980 U.S. and Japan launched a joint feasibility study for the storage of spent nuclear fuel from Japan, Taiwan and South Korea in the U.S. Trust Territories in the Pacific. The results have not been announced so far.
- Ruptured waste containers and radioactivity above normal levels has been detected off the coast of French Polynesia following weapons testing. The French blithely continue to test.
- In 1982, the U.S. Navy announced that it intended to sink at least 100 obsolete nuclear submarines in the Pacific during the next three decades.

Throughout Micronesia, there have been virtual epidemics of cancer and thyroid tumours, with women and children the principal victims. A macabre and increasing problem in the Pacific is what has come to be known as "jelly-fish babies" — babies born with no separately formed heads or limbs who die a few hours after birth.

Realizing the danger to their children and their progeny, women in the Pacific have decided that they will not allow this "sword" to hang over their heads anymore. They have joined forces to oppose the militarisation and the pollution of their land and water. They are asking women around the world to join them in providing a support and form an information network. As a step in this direction, Women for Mutual Security (WMS) - a coalition committed to world peace and common security sponsored the International Pacific Policy Congress from January 7th to January 12th, 1991 in Port Vila, Vannatu.

The conference brought together women activists from the Pacific, New Zealand, Australia, Africa and North and South America. The participants decided to take the initiative in informing women's movement activists around the world of the status and the effects on women and their families of nuclear and missile tests, military stockpiles and the dumping of hazardous chemical and nuclear wastes in and around the Pacific Islands. They also decided to work closely together and with other groups working in the Pacific on different issues such as environmental hazards, problems of indigenous people, the women's movement peace and development issues.

WANE Declaration of Support

The word radiation is not new for us in Kerala. The coastal sands of Alapad, Ponmana, Chavara, Neendakara in the Kollam district contain large amounts of radioactive thorium. The people living in these areas have been subjected to some of the highest natural background radiation in the world for centuries. We see the ill effects of this radiation on them in the form of higher incidence of all sorts of diseases and a large number of Down's syndrome children. (For a detailed description please see the January 1991 issue of *Safe Energy and Environment* -Editor)

Though the birth of a physically and mentally handicapped baby is a problem for the parents, family and the society at large, the whole responsibility of the child is entirely on the mother, in the present social set up. Pregnant women and developing infants are most vulnerable to radiation. We see the devastation of the earth by the corporate warriors and the threat of nuclear annihilation by the military warriors as feminist concerns.

We don't want to live on a dying planet, drinking its poisoned waters, eating its irradiated food and breathing its contaminated air. We envisage our life as being in harmony with the life of the planet as a whole.

We strongly protest and raise our voice against the injustices being perpetrated on our sisters in the' Pacific. We urge individuals and groups everywhere to join hands with us in extendingsupport to Women for Mutual Security in their activities and struggles.

Please send your letter of support to:

Women for Mutual Security,
1. Romilla St. 146, 71
Kastri, Athens, GREECE

Ms. Nandini
Women Against Nuclear Energy,
X/526, Koyickal House, Kottayam-2, Kerala

Business Before Bombs

Hindsight, it is said, is always twenty twenty. Perhaps. But are the lessons learnt from the bitter experiences of the past any use in moderating future excesses? Not, it would seem, when there are profits to be made.

"Misleading labels for technological projects can conceal important policy issues. "Project Plowshare" was the name given in 1950s to the plan of using nuclear explosions for peaceful purposes — the labelling was plainly misleading. It made it easier for Indians to pretend that their nuclear explosion served only peaceful purposes. People think of swords that have been forged into plowshares as harmless because they cannot be used for war: but so-called "peaceful" nuclear explosions can destroy a city. Indeed, a basic weakness of some of the past policies has been the assumption that an application of nuclear energy will not be of military use simply because it has some civilian use."

The above is a quote from Fred Charles Ikle, who • served under Presidents Nixon and Ford as Director of U.S. Arms Control and Disarmament Agency. The article from which this quote has been taken appeared in *Bulletin of Atomic Scientists* of January, 1980. It is based on his foreword to the book, *Swords from Plowshares,* edited by Dr .Albert Wohlstetter and published by the University of Chicago Press in 1979. The research on which the book is based, according to Ikle, "revolutionized thinking in the United States and in other countries as well, leading the way to radical new departure in U.S. non-proliferation policy."

Unthinkable to Forego Nuclear Power

Tracing the history of non-proliferation efforts Ikle goes on: 'That it is undesirable for atomic weapons to spread is an idea as old as the nuclear age. And it was recognized from the very outset that the peaceful applications of nuclear technology would therefore have to be restricted. This was the outlook in 1945. It was natural and easy for President Truman and the Canadian and British Prime Ministers to agree that there should be no disclosure of information, "even about the industrial applications" of atomic energy, until an international system of control was set up. Some twenty years later these priorities had become completely reversed. In 1968, U.S.A.'s ambassador Arthur Goldberg told the United Nations that it would be an "unacceptable choice" indeed "unthinkable" to decide that non-nuclear countries "must do without this extremely promising energy source—nuclear power—simply because we lack an agreed means to safeguard that power for peace."

No Dividing Line

The "principal culprit" for this turnaround was the "Atoms for Peace" programme, according to Ikle. 'Particularly harmful has been the lack of understanding of the physical realities that would govern diversions of ostensibly peaceful nuclear activities to a weapons programme. Far too much assurance was drawn from the fact information on design of weapons would continue to be kept secret and far too little stress was placed on the dangers of spreading technology and materials for the bombs themselves. This misunderstanding was compounded by the persistence within the U.S. government of a specific piece of misinformation: the claim that plutonium from power reactors was normally not suitable for making bombs. It is not quite clear why so many technically competent people helped to propagate this erroneous notion. It is clear, unhappily, that some used it deliberately to deceive their superiors as to the dangers of plutonium recycling....It was strange — indeed irresponsible — that the engineers and scientists who developed the reactor technology during the 1950s and 1960s so badly neglected the technical factors that could help divide the peaceful from the destructive use of the atom. Little effort was made to analyse this dividing line, let alone to strengthen it. Indeed in some instances, the dividing line was mindlessly weakened. For example, to reprocess spent reactor fuel, the designers chose the Purex method, which had been designed to produce especially pure plutonium -for what purpose? For making bombs. This Purex method was subsequently assiduously distributed by the U.S. Atomic Energy Commission throughout the world. Over 11,000 technical papers were declassified in the proliferation avalanche released by the Atoms for Peace programme."

Thriving Arms Business

I have quoted rather extensively from this article just because it is not some run of the mill academic who has written it but a senior official in the U.S.administration, who moreover states that, 'The research reported in *Swords from Plowshares,* made a most critical contribution towards a more effective policy against proliferation." One would naturally assume from all this that the lessons from the mistakes made in the Atoms for Peace programme had been learnt and were now not likely to be repeated. And one would, naturally, be wrong. After all business is business and there is no business like the arms business. Ask Adnan Khashoggi and Chandraswami if you don't believe me!

The following is mainly taken from a news-report **which appeared in the *Asian Wall Street Journal* of** December 10,1990.

In a crowded hotel room at Oak Ridge in east Tennessee, just outside a federal bomb factory known as Y-12, weapons managers who have spent their lives sworn to secrecy unveil their newest project. By Christmas, they plan to declassify -after 45 years -the membranes used to enrich uranium for hydrogen bombs and license the technology to U.S.companies. The membranes could be used to clean smokestack gases, purify water and filter beer, says James Palmer, the project manager.

These are times of momentous change at the U.S.Energy Department's $9 billion empire of research labs, nuclear reactors, weapons factories and a desert test site dedicated to building nuclear weapons. As the Soviet military threat wanes, scientists and engineers who produced generation after generation of doomsday weapons are offering to help arm U.S.companies technologically against Japanese and German competitors.

No More Sugar Daddy

In showing off technology to makers of cars and computer chips and trying to eliminate whole categories of classification, Energy Department officials hope to do more than simply make U.S. in-

The Eveready Connection

'The environment around Oak Ridge received tremendous abuse form the beginning. Despite the fact that people across the country were developing a greater appreciation and understanding of the environment during the sixties and the seventies, and passing legislation to enforce protection standards, environmental protection at Oak Ridge remained archaic at best."

"When Washington pursued the development of the hydrogen bomb in the early 1950's, Y-12 was chosen as the site for the chemical separation of lithium-6 from the more abundant lithium-7. This lithium isotope separation process required a large amount of mercury. It has been stated that over half of all the mined mercury in the world was at one time in Oak Ridge.The handling of this toxic substance was lax at best. Workers claim that they would at times wade in mercury following spills or leaks. Major mercury spills took place. Three spills of over 100,000 pounds have been revealed with numerous spills over 20,000 pounds. Over two million pounds of mercury remain lost to the environment."

'The Tennessee Department of Health and Environment was aware of some of the environmental problems but was unsure of its enforcement role with respect to a federal government facility. More importantly, operators at Oak Ridge had effectively used "national security"as an intimidating shield which thwarted serious investigation of the facility."

"A 1984 newspaper report disclosed that the Y-12 Plant had lost over 1,700 pounds of weapons grade uranium-235 between 1947 and 1982. This amount would allow for the production of eighty-five atomic bombs. Department of Energy has never publicly accounted for the loss of weapons grade material claiming material inventories are classified."

"The diversity of Y-12 Plant's processes generated large volumes of hazardous and radioactive waste. Inadequate past disposal practices have created serious present day environmental problems. Department of Energy has already spent $ 1 billion cleaning up Y-12 and adjacent facilities and figures it needs another $4 billion to complete the job."

From A Citizen's Guide to Oak Ridge produced by the Oak Ridge Environmental Peace Alliance

The name of the company which has been the operator of most of Oak Ridge facilities including the Y-12 plant since 1947:

None other than the butchers of Bhopal: **Union Carbide.**

dustry more efficient. They say they want to let U.S. researchers trade information more easily. They contend that release of the membrane technology alone might increase U.S. exports by $1 billion per year. And by allowing outsiders to tour parts of Y-12 and other facilities, the officials make another consideration abundantly clear: They desperately need new work. "Sugar Daddy is gone for Y-12," says Albert Stephens, who heads computerized manufacturing at the plant.

The department wants to prove the value of the weapons complex in an age when nuclear weapons production has become less important. Flexible, high precision manufacturing, perfected during decades of bomb making, is the wave of the future for makers of such things as jet planes, engines, machine tools and specialty electronics.

A visit to Y-12 is revealing. At the Alpha One machine shop, which once housed giant magnets for processing uranium, Y-12 managers show off advanced machines and computers used to make and measure parts for nuclear weapons. But most of the shop equipment is hidden behind yellow curtains; so are pallets of finished bomb parts. Workers are nowhere to be seen. The place is library-quiet.

The eerie silence reflects more than secrecy. With the demand for nuclear weapons sagging and environmental problems eating up more of its budget, Y-12 has laid off 11 % of its weapons production workforce during the past one year; employment is down to just 5,855

Undesirable Customers

Weapons based technology, though, could be invaluable to some customers the U.S. would rather shun -Iraq, Libya, Pakistan and other countries trying to build nuclear weapons. Consider the uranium enrichment membranes. These are used to separate uranium-235 from uranium 238. Energy Department intelligence officials say Argentina has tried membrane technology to produce nuclear material, but so far unsuccessfully. The U.S. membranes, which are far more durable than others now available, could help Argentina and other countries make nuclear bombs. So could computerized cutting and assembly tools.

That prospect clearly worries scientists in the weaponscomplex. Los Alamos National Laboratory has produced a 500 page secret document detailing what is needed to make a nuclear weapon and where to buy it, to help experts block sales. 'It's a Sears catalogue of nuclear weapons," says Rodney Thurston, a Los Alamos proliferation expert.

Energy Department officials say the benefits of helping U.S. industry outweighs the risks. For enriching uranium , the membrane technology is outdated anyway, they say; most would-be bomb makers now use centrifuges. And the machine tools are far beyond what a first time bomb maker would need.

Indeed Bryan Siebert, who heads the Energy Department's classification and technology transfer programme, wants to pry the weapons complex open even further. Largely, at his urging, the agency is reviewing nuclear weapons secrecy with a goal of liberalizing the rules by mid-1991.The effort is so controversial, he says, that 90% of the people in classification want to hit me."

Secrecy Interferes with Technology

But he has enlisted powerful allies. One is Dr Edward Teller, the weapon's complex most famous scientist and the father of the hydrogen bomb. Dr. Teller is urging the agency to abandon one category of secrets entirely and to declassify all conceptual information about nuclear weapons that is five years old. "Secrecy doesn't work," he says. "It interferes with the progress of technology."

Now, Y-12 plans to license its technology to any concern that manufactures in the U.S. - a definition that would include most big foreign companies. That proposal enrages Mr Seibert. 'Til keep the Jap. lose out." After 45 years of working on the bomb, he believes that U.S. economy should get some returns for an investment of hundreds of billions of dollars.

False Aura of Profitability

To get back to Mr Ikle and the follies of Atoms for Peace:
"Several misperceptions of the economic aspects of nuclear power also played a role in the spread of weapons capabilities. American reactor manufacturers failed to anticipate that by exporting their technology they would create other exporters that could take future sales away from them. Moreover, the reactor business acquired a false aura of profitability both in the U.S. and in Western Europe, because many of the costs were either borne by the governments or obscured by the size and complexities of large corporations.

The major force behind the Atoms for Peace programme too, was a desire to recover some returns for an investment of billions of dollars into nuclear weapons production, made during the Second World War. The end of the Cold War seems to have provoked precisely the same reaction. As these technologies become more and more widespread, they are bound eventually to find their way sooner or later to not only other nations but also disaffected sub-national groups as well as underworld organisations such as the Mafia. If that prospect gives you the chills, have a glass of ultrapurified water or better still membrane filtered beer, to soothe your nerves. Cheers!

Surendra Gadekar

LETTER BOX

Anumukti Volume 4 Number 2 October/November 1990 arrived in due time informing me to send the subscription for renewal. My views, frankly stated are as follows:
I have no mind to send the subscription money because:
a) I am a lay reader.
b) *Anumukti* is never on time and the excuses for delay sound absolutely hollow. Mere jugglery of words does not serve the purpose.
c) Shri Narayan Desai is nowhere now in *Anumukti*
I used to subscribe since Shri Desai used to write off and on in *Anumukti* with his sweet charming easy English giving ample food for thought.

Hari Singh
Jodhpur

I have been followingyour various efforts through *Anumukti*. My best wishes to your efforts and I hope that it will become loud enough to stop the government from pursuing these mad projects in the name of 'progress'.
I am currently working on a social, economic, political model for India. As a prelude to it I had perforce to understand the various facets of our progress in the last forty years to understand how we had managed to create filth and nothing but filth during this period.
In the course of this work I examined the role of technology in the national advancement of the country. I, like every other informed person had fully accepted the benefits of technology to mankind. (Of course one would draw away from its negative and dirty aspects.) What I saw as a result of my study really shook me. I now believe that technology dazzles and blinds even sensible and sensitive people and hence the mad rush towards technology oriented development. It is, therefore,necessary for people to have a **really good look** at what technology does to people and modify their stance accordingly. None of the scientists, however brilliant they may be in their fields, would have the capacity to get out of their deep trenches of learning and expertise and to take a broader look and see the limitations of technology oriented development. India is a beautiful country - has survived a lot of insane leaderships. I am sure we will surface out of the current chaos much sooner than we imagine.

Sri Sankaran
Pondicherry

I am enclosing with this letter an article by Dr A D Damodaran, Director Regional Research Laboratory, which appeared in *Voice of Electricity Workers* a publication of the Electricity Employees Federation of India a trade union affiliated to CITU. This paper was presented in a seminar organised by the Kerala State Electricity Workers Association at Ernakulam with a view to win public support for the proposed nuclear reactor in Kerala.

Notice the zeal with which this CSIR scientist advocates nuclearization. Each of his arguments needs a complete rebuttal. The blind enthusiasm of the author to underplay the hazards of nuclear power and to suppress opposition is extremely conspicuous. Can you do some thing about it in *Anumukti?*

K. Ramchandran
Payyanur

The length ofDrDamodaran'spaper (more than four and a half pages - and that is just the excerpts- prevents us from publishing it in full for a detailed rebuttal. However, most of his arguments are old hat and have been refuted many times previously in Anumukti. I will comment on a few of them since they are nowadays being repeated ad-nauseam by nucleocrats in advertisements.

Other countries have a much larger share of nuclear electricity.
"Europe outside of USSR (an area almost equal to India) has 183 power reactors and also 106 research reactors thus making a total of 209 reactors in all. France has 55 reactors in a country more or less the size of Tamil Nadu.
No comments on his mathematical powers! It could have been a typographical error. Geography, he fails! (Tamil Nadu area is 129,900 sq km while the area of France is 547,033 sq km)
He does not for some reason mention the reactors on the submarines in their waters but they too would be a substantial number - well into hundreds. All these countries got deeper into the nuclear hole faster than we did and now do not know how to get out without a great strain on their economies. But the fact is, that all of them, France included are trying not to get in any deeper. Last year no OECD nation ordered a nuclear reactor with the sole exception of Japan. (See the story on Japanese nuclear power programme in this issue.)

** Nuclear electricity is cheap"
"French electricity which is almost three quarters nuclear is the cheapest in Europe."

The great secret of "cheap' nuclear electricity can be revealed in just two words — hidden subsidies! (See the story on British nuclear costs in this issue). The French electricity board - Electricite du France - has a debt that puts the debt of some Latin American nations to shame. Even its chairman has admitted that last year had been "disastrous" from a financial point of view.*

Demonstrated competence

"With over 70 reactor-years of experience, we are well poised to manage safely these otherwise complex systems."

The US had already accumulated hundreds of reactor-years of experience before the accident at Three Mile Island as had the Russians before Chernobyl. That we haven't had a great big disaster till now is more an indicator of the fact that we have had very little experience. Of these seventy reactor-years nearly ten reactor-years should be deducted since they refer to RAPP-1 which was essentially in a shut down condition. (See the story on RAPP -1 in this issue).

Indian reactors are safer

'Indian reactors have a number of features which make accident conditions highly improbable among them negative power coefficient of reactivity which ensures that the reactor shuts down in case of a power excursion."

It is shameful for a senior scientist like Dr Damodaran to make statements that are factually erroneous. Whether he has done this deliberately or out of sheer ignorance is besides the point The mainstay of the Indian nuclear programme the CANDU type reactors have a positive reactivity coefficient. Thus in case of a loss of coolant during a power excursion the reactor instead of shutting down would produce still grater power causing a Chernobyl type disaster. (See Chernobyl Reactor's Next of Kin in this issue)

No Alternatives

"Be it hydro, be it thermal or be it nuclear there are always groups to protest with a common advice to go for solar wind, wave and minihydro sources, when none of them have been accepted for this role by any nation on earth !"

During just five years, the State of California installed more than 10,000 MW of power from precisely just these sources. 10,000 MW is what the Indian nuclear programme hopes to achieve by the year 2000 A.D. under a fifteen year plan and it is a good bet that it would fail. We do not suffer from a lack of sources of energy : what we do suffer from is a lack of imagination on part of our scientists and technologists who cannot conceive of a source of power which is not centralized and hence under their control.

Public Debates: A Waste of Time

"Public involvement on crucial development issues is a must and is a healthy trend. However this involvement has to be convereted into a constructive methodology, failing which the so-called involvement will only end up in endless debates, qualitative, emotional and many a time even self-defeating. Hence the normal practice in many countries, specifically the advanced ones, is to appoint appropriate bodies consisting of professionals, public men, elected representatives of the people, concerned experts, etc., based on which a policy is announced in the forms of White Papers, which forms action plans about which no more debates are encouraged save exceptional new situations. Unless our Governments start these well tried out practices, we would not be able to undertake any serious developmental programmes.

It is precisely this kind of 'guided democracy' that has made an ecological disaster area out of Eastern Europe and Soviet Union. Professionals have demonstrated a professional ability to pick the just fruits of development for themselves without getting pricked by the thorns ! That is what the debate is all about. Mere lip service to "public involvement in development" will no longer suffice. There has to be a real devolution of power.

NAVAL ACCIDENT

In May 1985, an accident occurrrred in a Soviet nuclear-powered sub-marine at the dock at the Pacific coast settlement of Dunay (also in the Soviet Far East, and 35 miles east of Vladivostok). A letter to the Soviet weekhy magazine "Ogonyok" which describes the accident says that an explosion of the submarine's nuclear power unit caused radioactive contamination of the Amur Gulf, where the submarine was being repaired.

According to another report, from "Information Update" (a bulletin put out by the Pacific Campaign to Disarm the Seas), residents of the area claim that while the sub was being refuelled, the lid of the reactor was forced off prematurely, due either to an explosion and fire or to the reactor starting up accidentally. Several people were killed and the submarine sank at dockside. The dock was so badly contaminated that it is still unusable. It is not known what happened to the submarine, but the radiation has migrated. The contaminated area is about 100 meters wide and 600 meters long. Cleanup of the site has involved removal of 2000 cubic meters of contaminated material to a temporary dump site in the area. Another 200 square meters was cleared away last year. No decision has been made as to final disposal of the contaminated material.

Local residents are continuing their protests. The letter published in "Ogonyok" was signed by 116 residents form Dunay and claims that there are many more cases of similar accidents which have also been covered up. Deputies in the region who have been investigating the accdient have also denounced the military's environmental record, claiming that the temporary site and other waste dumps in the area are neither well protected nor safe. The deputy from Dunay said local people had broken through fences around the area to walk or gather mushrooms. He noted, "We need somebody to protect us from the military."

NOTICE BOARD

Chernobyl Day Event

Citizens for Alternatives to Nuclear Energy (CANE) a Bangalore based antinuclear group is organising a three day workshop on nuclear energy and people's movements on April 26 to April 28, 1991 in Bangalore.

We feel that it would be very useful for the people/groups engaged in questioning the nuclear establishment to get together for a good sharing. We believe that we have a lot to learn from one another. Various groups/individuals are doing much more than what gets communicated to the rest.

In the three days at the workshop we hope to have

- good sharing on our strengths and weaknesses
- critical reflection on the methodologies that we use as public interest movements
- a close look at the threats we face
- learn more about various aspects of nuclear power from scientists
- get to know one another better so that we know where we can draw support from in times of need

We would like each group to be represented by two persons, one who has been taking primary responsibility and another who can step into that position when the need arises. Although we know that it would be difficult for most groups and individuals to meet all the expenses to come to Bangalore, we are unable to offer any subsidy to meet travel costs from our side. In case of dire need, please try and find a local sponsor and also inform us and we too would try to find someone to help partially meet travel expenses. But we would really like that you make your best efforts to come.

Contact Address: K.Krupa
CANE, 809, 17 E Main, Rajaji Nagar, 5th Block
Bangalore 560010,

International Women's Day

BAILANCHO SAAD, a women's group from Goa, is organising a function at Panjim to commemorate International Women's Day on March 8th, 1991. The theme of the function will be "Nuclear Energy and Women" The programme includes two talks by antinuclear women activists and a slide show with slides on Kaiga nuclear power plant.

Rally Against Koodankulam

Murpokku Manavar Sangam and Murpokku Ilaignar Ani, two associations of progressive students and youth held a cycle rally against the Koodankulam nuclear power plant starting from Madras on January 30th, 1991. Their programme included halts and meetings at many places on the way including Vellore, Dharmapuri, Coimbatore, Ramanandapuram and Madurai. They converged on Tirunelveli on 10th of February, where there was a public meeting followed by a cultural programme by Jan Natya Mandali.

T.Sengadir and T.Vinmeen Pandian
Pudu Iyakkam
35 Avvai Nagar
Pondicherry 605008

Subscription Rates :

Rs. 25/' per year South Asia

U.S. $ 15/' per year air mail overseas
(Rs. 200/' per year if paid for in India)
Lifetime Rs. 250/- (only within India)
Please add Rs. 6 for cheques
Drafts should be drawn on State Bank of India Valod (0531)

Editor : Surendra Gadekar
Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

i Editor Anumukti
Samp oorna Kranti Vidyalaya
j Dist.: Surat, 394641 INDIA i
Vedchhi,

Published by S. Gadekar for Sampoorna Krariti Vidyalaya and printed by him at Parijat Printery, Ahmedabad, typeset by Parijat Shah & Associates, Ahmedabad.

PRINTED
MATTER
BOOK POST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 5 April / May 1991

Cowardice asks the question-is it safe ?
Expediency asks the question-is it politic ?
Vanity asks the question-is it popular ?
But Conscience asks the question-is it right ?
And there comes a time when one must take
a position that is neither safe, nor politic,
not popular-but one must take it because it is right.

Martin Luther King Jr.

Crossing The Line

The first time I crossed the line was in Boise, Idaho, on a November afternoon in 1971. With nineteen companions, I formed a human chain across Capitol Boulevard, a main thoroughfare in the heart of the city. There were just enough of us to block the boulevard from curb to curb.

Walking into the street that day, into the middle of traffic, I felt alternately foolish and scared. Would my nerve fail at the last minute ? Would I find myself all alone, dodging cars while motorists honked and spectators laughed ? Would blood run on Capitol Boulevard, spilled as a consequence of my rash words ? Would I be arrested, mugged, finger-printed, jailed, given a police record ?

When the first blockader reached the far curb we stopped and turned, facing the oncoming cars. The traffic came to a stop. Our supporters worked their way from car to car, explaining the delay, asking drivers to turn heir lights on if they agreed with us.

We heard honks and yells. Then some lights came on, then more. In a short time officers arrived from the police station, just two blocks away. They moved up and down the line, taking our photographs. Would we be dragged or simply led away ? I wondered when the arrests would begin.

Incredibly, there were no arrests. The police allowed us to continue blocking the boulevard for the remainder of our half-hour vigil, directing traffic into their streets. At exactly 3 o'clock, as a three megaton nuclear blast went off on schedule in far-off Alaska, we trooped off Capitol Boulevard, walking on air, delighted with ourselves at having conducted Idaho's first non-violent civil disobedience action in memory.

I was a forty-five-year-old journalist at the time, married and the father of three sons, editor of a weekly political newspaper, the *Intermountain Observer,* a radical and sometimes strident organ of social protest. We had been at the forefront of social protest in Idaho through the 1960s. On this occasion we were protesting the U.S. Atomic Energy Commission's plan to test an antiballistic missile nuclear warhead off the island of Amchitka in Alaska. It was a project that stirred widespread opposition from environmentalists and peace activists but had just been given the final go-ahead by virtue of a five-to-four decision of the United States Supreme Court.

Throughout the nation there were protest rallies on the day of the test explosion. I Boise the protest took the form of a spontaneous blockade of traffic-a demonstration of outrage that I had proposed and led.

The fear, stress and exhilaration of our stand on Capital Boulevard forged a bond among us. We felt like survivors of an earthquake, a flood, a battle in which we had risked much and won. As newspaper people and political activists many of us already were part of a closely knit group. Three of us comprised the entire paid staff of the *Observer*. Others were VISTA volunteers in the war on poverty, environmentalists, veterans of the civil rights and the antiwar movements. Most of us had standing in Idaho's liberal. Democratic establishment. The Amchitka action, requiring a measure of physical courage and moral certitude surpassing the demands of conventional journalism and politics, gave us a heightened feeling of closeness with each other. It produced a euphoria that proved to be short-lived.

That night, at a social gathering of liberal Democrats, the attorney general of the state of Idaho, a close friend whose election I had helped engineer the previous fall, went into a state of shock when we paused to watch the television news. There, in full view, were the protesters blocking a city street, with the police standing by. The camera zoomed in on his wife, Betsy Park, breaking the law with the whole world watching, while the commentator made pointed reference to her husband, the state's chief legal officer.

Scarcely less shocked or pained was my own wife, Kathleen, who, like Tony Park and some other spouses of the demonstrators, had had no advance notice of the Amchitka action. The demonstration opened a breach between us on the matter of personal risk taking as a form of social action.

But that was just the beginning of the fallout. A few days later the Observer's advertising representative reported wholesale defection in the thin ranks of our business patrons along Main Street. I was surprised by the severity of the backlash.

Even more astonishing to me was the reaction of our principal advertiser, the local CBS radio and television station, KBOI-TV, which also happened to be our owner. When I paid my weekly call on the station's business manager to pick up her advertisement for the next issue, she explained firmly but with some embarrassment, that there would be none. "It's a matter of principle," she said. "I just cannot condone that sort of thing."

A few days later I was called to the desk of KBOI news direct or Dick Eardley, a friend of many years and a popular Boise sportscaster who then served on the city council and was on his way to becoming mayor of the city. Eardley sat me down in the "goldfish bowl," a glassed-in library and conference room used for private conversations.

"Sam, I don't know how to tell you this," he began, half apologetically, "but we have decided to take you off the air." He went on to explain that I had crossed over into an area forbidden to professional journalists. He was sorry about it, and may be he was mistaken, but that was the way it would have to be.

For leading a street demonstrations against the testing of a nuclear bomb on an Alaskan island I had been judged no longer fit for writing, for reporting, for broadcasting at KBOI. How was this violation of journalistic neutrality different from a news director casting a city council vote for a multi-million-dollar downtown shopping mall ? I saw no point in arguing the case with Eardley because the difference was clear to both of us. The difference was in the style and purpose of our activism, not the activism itself. And the message in the goldfish bowl was equally clear : There was no room at KBOI for this kind of activism.

In the newsroom of Boise's most enlightened corporate media outlet, in the liberal business community, on the Democratic Party cocktail circuit, and in my own household I came up against the limits of tolerance in the weeks following my decision to stand in the street with others. I felt the pain of rejection and the gnawing fear of the loosening of career security. But the new ground on to which I had marched or stumbled or strayed felt right to me. I decided to stay there.

The actions of my later years, taken in the company of others, have led to occasional jailing and once to a six-month prison term. Always the feelings have been the same as when I first crossed the line in Boise many years ago. First has come an inner struggle, then a deep fear, then the calm of the action itself, then exhilaration (whatever the outcome), the sometimes painful satisfaction of having, as the Quakers say, "spoken truth to power." Always when I have crossed the line the ground on the other side has felt good.

Sam **Day Jr.**

Source: Crossing the Line
From editor to activist to inmate
- a writer's journey

The temptation of using somebody else's writing for an editorial is something I usually avoid. After all, if I did not have anything to say, what am I doing editing a journal in the first place ? But Sam Day's piece is precisely what I have wanted to say and he says it far better than I am able to. As we gather together on the 5th anniversary of Chernobyl, it is high time that we too cross the line and experience the ground on the other side.

Surendra Gadekar

Mihama Narrowly Escapes Being *Japan's Chernobyl*

On February 9, 1991, one of the steam generator tubes at Mihama Nuclear Power Plant owned by the Kansai Electric Power Company (KEPCO) in Fukui prefecture, ruptured in a double-ended guillotine break causing primary coolant leak to the secondary system and released radioactivity into the environment. Shutdown of the 500 Megawatt Pressurised Water Reactor occurred automatically when the damage to the steam generator activated the Emergency Core Cooling System (ECCS). This is the first time in the history of the Japanese nuclear programme that the ECCS, which is designed to contain nuclear accidents from turning into disaster has been triggered. It is also the first time that a double-ended guillotine break has ever taken place in Japan. Events at the reactor began at 12.40 p.m. when workers noticed that a meter in the control room showed a sudden jump in radioactivity in the secondary cooling system. According to the *New York *Times* they spent the next 50 minutes trying to determine whether or not the meter was providing false readings - a common occurrance at nuclear power plants. Another report from *Associated Press,* says that the technicians simply ignored the warning, because they thought the meter was broken. In the meantime, though, the reactor was heading for potential disaster.

When workers finally realized that tons of mildly radioactive water were pouring into the steam generator, where the water supply is supposed to be uncontaminated, they tried to activate a critical emergency pressure valve. It failed to function. By 1:50 p.m. **a** monitor showed that radiation levels were 1,250 times the normal in the secondary cooling system. At the same time, water pressure in the core dropped drastically and the ECCS kicked, in, shutting down the reactor.

Japan Times reported that, "About 50 to 500 display panels in the control room repeatedly turned off and on. Roaring similar to the sound of jet engines was heard severals times. White puffs of steam were seen outside the reactor. An employees said that this was probably because a safety valve was activated following a pressure increase in the secondary cooling system." The paper said that it was not known why the emergency pressure valve didn't work. If it had, the flow of primary cooling water into the secondary system would have been far less. Reportedly, 20 tonnes of primary coolant poured out into the secondary system.

The owners of the plant KEPCO have traced the cause of the accident to one of the 3,200 metal tubes used to heat secondary cooling water in the steam generator. The tube had been severed, causing the massive leakage of contaminated cooling water. This is the second time that a tube has been completely severed. The North Anna nuclear power plant in the U.S. had the same problem four years ago. The finding has dealt a serious blow to the government and Japanese power company officials who had claimed that any faults in the reactors would be detected during routine inspections. *(Mr Nadkarniplease take note of this.)* (See page 3) According to KEPCO the tube in question had in fact been cleared during an inspection conducted last year.

Engineers who examined the damaged tube found that Engineers who examined the damaged tube found that it had been horizontally severed near the No. 6 metal plate, one of the sin plates supporting all the tubes. The exact cause of the damage has not yet been determined, but they say that the tube may have been dented by the metal plate, which could have swelled from rusting over the years. A swelled metal plate was the major cause of the North Anna problem, but KEPCO officials refused to take that seriously, saying that there was an extremely small probability of such an accident occurring in Japan.

According to experts, the plates, made of carbon steel, are likely to rust when they react with oxygen found in the secondary cooling water, possibly causing the metal tubes to dent. There are ten reactor in Japan - including five operated by KEPCO - currently using the same type of plates.

The reactor, which began operation in 1972, is one of four at the Mihama power station. Its design was based on that originally supplied by the U.S. Corporation, Westinghouse. This is not the first time that it has had problems. Cracks appeared in the piping of the reactor in 1975,1979 and 1983, causing radioactive leaks from the steam generator.

In fact the Mihama power station as a whole has had a rather troubled history, especially its unit-1. That unit, a 340 MW plant, began operation in November 1970, but suspended operation in July 1974 after an accident involving the steam generator. Operation was suspended again in December 1976 after it was disclosed that some fuel rods had broken since March 1973 and KEPCO had been concealing the accident for more than three years. Then on 22nd May, 1981, about three tons of primary coolant leaked, causing serious radioactive contamination to workers. Three employees were splashed directly with the coolant and radioactive gas was released into the atmosphere for over two hours. On 22nd September 1982, the director of this troubled plant tried to kill himself by cutting his throat with a knife.

On March 1st, after persistent public demand, Ministry of International Trade and Industry and KEPCO released a somewhat detailed report on the accident. This report reveals some frightening new facts :

O The main steam isolation valve of the damaged steam generator loop failed to shut when an operator in the control room tried to shut it. The valve was closed manually, seven minutes later by an operator despatched to do the job.

O The ECCS contributed little to the cooling of the core, quite contrary to the first announcements of nuclear officials. Because the pressurizer relief valves were stuck shut, the primary coolant pressure remained high (around 100 kg/cm2), preventing the safety injection of emergency water from the two high pressure injection pumps. The two pumps each had a normal capacity of 159 cubic meters per hour. They had been activated for some 47 minutes but the total amount of water injected was only 30 cubic meters.

O Due to insufficient cooling, the core began to boil for about 15 minutes into the accident, but extensive boiling was narrowly avoided by blowing much steam from the sound steam generator and also some from the damaged steam generator into the air which caused some radiation releases into the air.

O The control room was quite unprepared for the situation caused by both of the two pressurizer relief valves not working. This was outside of the accident scenarios for which the operators have been trained using simulators. They tried in vain for about 24 minutes to open the valves. Then they used the auxiliary pressure spray to depressurize, but since it was not too effective they switched off the High Pressure Injection pumps to reduce the primary system pressure. This act is considered to be a violation of the operation manual and reminds us of the Three Mile Island accident where too judgment of the operator to switch off a similar high pressure pump contributed crucially to the core meltdown.

Based on an article in
WISE News Communique No 347,
and a press release from Citizens' Nuclear

Information Center,Tokyo.

"Nothing to Fear" But...

In our last issue, Anumukti Vol.4 No.4 February / March 1991, we had reprinted an article by Shri Kumar Basu under the heading "Unallayed Fears" which described the could not-careless attitude of the Nuclear Power Corporation regarding problems being encountered with the south end shield of Rajasthan Atomic Power Plant at Rawatbhata. Welt, the original article in The Independent has elicited a rejoinder from Shri G.V. Nadkarny, who is the Director, Environmental and Public Awareness, Nuclear Power Corporation. Now, normally we do not reproduce rejoinders from nucleocrats, since we feel that they have enough resources to be able to put forth their viewpoint before the public without depriving us of precious space. However, we are making an exception for this article since it provides a good footboard to raise many questions that need to be highlighted and is a very good illustration of the hubris that afflicts the nuclear establishment in India. (The comments in bold type are the editors rejoinder to this rejoinder.)

The main objective of the ten-part series titled "Nuclear Power and You" issued recently by Nuclear Power Corporation for public information was to allay any fears regarding nuclear power; more so, given the eagerness of some journalists to come up with sensational articles likely to whip up public fears.

Why is it that the need to "allay fears" regarding nuclear power has only arisen now, more than two decades after the commencement of nuclear power generation in this country ? Have the journalist suddenly become scurrilous sensationalists ? Or is it because with long experience, the total irrelevance of nuclear power to India has started becoming more and more apparent and the harmful effects have now become impossible to hide.

Plant Performance

A case in point is Kumar Basu's article appearing in *The Independent* of February 20,1991. Though the article indicated that the advertisements concealed the greatest dilemma the country encountered regarding abandoning a crippled nuclear power plant or salvaging it by yet to be proved technology, serial number 4 of Nuclear Power and You series did mention the problems regarding the south end shield of RAPS-1 during 1981 to 86 and its restoration to 50 percent of full power since August 1987 as well as the performance of each of the six operating Indian nuclear power plants.

The series of advertisements "Nuclear Power and You" is indeed, aptly named. It does put the interests of nuclear power before it puts you. But for this happy nomenclature, it is an abomination-full of half truths and disinformation. It also contains grave errors of fact, vilfully used to deceive the public. A case in point is the example for nuclear power plant performance mentioned by Shri Nadkaray. Normally, plant performance is measured as a ratio of the power actually delivered in the installed capacity. However, most Indian plants have been subsequently "derated". That is, after a few years of operation and encountering serious problems, the authorities have decided not to run the plant at its full capacity buy at some reduced capacity. (In the case of RAPS-1, this reduction has been from 235 MW to 90 MW-what Shri Nadkarny persists in calling "50 per cent of full power"). The capacity factors mentioned in the ad have been calculated with these derated capacities to make them look somewhat less dismal. However, what takes the cake is the fact that in another advertisement in the same series, while toting up the cumulative nuclear power generation capacities the figures used are of the original (non-derated) capacities. A fine example of having your cake and eating it too!

Nuclear Mindset

Contrary to what the article said, there was no dilemma about abandoning or salvaging RPAS-1. The clear options were implementing repairs to restore it to operation in the short run and planned replacement of the end-shield, at the appropriate time, to extend the unit's life in the long run.

To close down a potentially hazardous reactor is not to abandon it, but rather to not abandon the people (who ought to be the primary concern) to its dangers. The very language of abandonment and salvaging makes one feel that it some broken marriage that Shri Nadkarny is discussing. And his primary attachment is to this piece of junk equipment and not to the people living in the vicinity and not even to the workers who have to face the dangers.

Basu's article raises questions about whether a bigger crack in the end-shield would result in the leakage of light water leading to a loss of coolant phenomena and a consequent catastrophe or if there is continuing apprehension that there could be a catastrophe any time. The answer is no. The light water leakage will be detected immediately and the reactor shut down. Producers have been laid down to handle such an eventuality safely.

Examples abound from all over the world that it is precisely this ("The answer is no.") cocksure attitude-this nuclear mindset - which is the major cause of nuclear disaster. (See the story on Japanese nuclear accident in this issue for another example of the "It can't happen here" syndrome. The belief that pipes would spring detectable leaks before breaks seems good in theory and probably does happen a lot in practice too, but it is not something to bet your life on. Since nucleocrats are betting not their own but their suboridnate's lives this arrogance is likely to continue till comuppence.

Worker Exposure

Also, apprehensions that the workmen involved in the operation may have been exposed to higher doses of radiation are not borne out by facts. By and large, among the workers involved in the end-shield repair work, no one was exposed to individual doses beyond permissible limits and the cumulative doses were also within the limits stipulated for the station.

Would DAE allow outside independent investigators access to medical records of nuclear workers as has been permitted in U.S.A. And what is meant by this by and large ? Does it mean that some workers have received dosages in excess of 'permissible' limits ? These limits themselves are set way too high. For example: the permissible dose limit for nuclear workers is 5 rems/year. Most workers usually are reported to receive around one rem every year. The latest study on cancer risks to nuclear workers (See "Another Nail in the Coffin" page) shows an increased risk even in workers who had received doses of around that much in their entire working lifetime! Also, what about the temporary workers - of whose radiation dosage no records are maintained ?

Organisational Autonomy

The article also states that the "Safety Committee put its foot down and advised a permanent shut down of the unit which it believed could not be repaired. But the DAE prevailed over the Safety Committee." In fact, it was the RAPS operating crew and management which shut down the unit in September 1981, (after the leak in the south end-shield first appeared), on their own, based on the technical specifications and an inbuilt safety culture. There is therefore, no question of the DAE prevailing over the Safety Committee, neither did the Safety Committee advise or instruct RAPS for permanently shutting down the unit.

This is the one point where I am in complete agreement with Shri Nadkarny. NPC, AERB, PPED, Safety Committee, etc. are all non-autonomous organisations under DAE control. To think that they can take an independent stand on anything is rather far-fetched. The Safety Committee could not have put its foot down since it did not have any feet in the first place!

No Compromise on Safety

It is also incorrect to say that in the event of an emergency, the shut down will be hurried and safety precautions not taken and that the NPC, oblivious of future catastrophe is keeping the reactor running, for fear that a power shortage in the state may evoke adverse public reaction. The NPC is fully aware of the implications of operating RAPS-1 and will not compromise on safety. The object of running RAPS-1 is to get maximum mileage and to not deny Rajasthan State Electricity Board the benefit of sizeable amount of power (90 MW) at which the unit can be operated safely, before long term work on the end-shield replacement is taken up. There was certainly no fear of public reaction to power shortages which are quite common in most states in India with demand far outstripping supply.

It is preposterous to suggest that during an emergency, shut down will proceed in a calm unhurried manner. Mistakes will be made and safely precautions overlooked. That is just human nature and not even nucleocrats can change it.

Contrary to the facts put forward by Basu, the end-shield of RAPS-1 were manufactured in India using sub-assemblies received from Canada. On receipt of the end-shields at site, defects were noticed and repaired by welding. Local stress relieving was carried out a site since stress relieving of the entire finished end-shield was impractical.

If the subassemblies were received from Canada, what manufacturing was being done in India ? Another application of our famous screwdriver technology! Also it seems somewhat strange that the defects were not noticed in the subassemblies. Did they not have quality control at each stage of "manufacturing."

The cracks appeared after eight years of operations. The entire issue of the causes of the leaks and the ways of plugging them was discussed in depth with various research units of the government.

Chemical plugging was tried in 1982, and mechanical plugs were used in 1985. Additional cracks in the vulnerable zone caused more leaks and these were closed with additional plugs. This was a time consuming job as the cracks were in inaccessible locations which could be reached only with specially devised remote tooling. All repairs were carried out with the approval of the AERB which stipulated a limit of 50 percent of full power on RAPS-1 operations as abundant caution, considering the stress patterns in the vulnerable zone.

The delay in long term rehabilitation of RAPS-1 is neither due to paucity of funds, nor general apathy of DAE as pointed out in the article, but due only to the complexity of the job and scheduling for appropriate time considering the need to replace to coolant tubes.

The job must indeed be extremely complex if the best "brains" and no paucity of money, it has not even been attempted for the better part of a decade.

End-shield of identical design and material (3.5% nickel steel) have been used at Douglas Point in Canada, RAPS-1 and 2 and MAPS-1. Cracks in the tube sheet have appeared only in RAPS-1. The Douglas Point reactor was not shut down due to end-shield problems. The MAPS-2 end-shield is of stainless steel and all subsequent units have stainless steel integral end-shields. These are not expected to suffer a recurrence of the RAPS-1 end-shield problems.

Finally Basu asks, "Why did the DAE rush ahead to commission similar reactors at RAPS-2, MAPS-1 and MAPS-2, if the performance of the prototype reactor RAPS-1 was not assessed" and assumes that the pronuclear lobby is unwilling to answer. The answer, in fact, has been given since long; the key word of the Indian nuclear power programme being self reliance best suited to our national interest.

Nucleocrats believe that by wrapping themselves in the tricolour and shouting "NATIONAL INTEREST" all questions would automatically disappear. No! Mr Nadkarny. Pray, what national interest was served by not first evaluating the shoddy performance of the post-fact "prototype" before rushing into creating, more such junk. And where has this loudly proclaimed self-reliance suddenly vanished when you are dealing with the Russian and the French for getting crumbs of their technology.

Kumar Basil's reply: My article is based on documents furnished by Department of Atomic Energy and my conversations with members of the Atomic Energy Regulatory Board. Though Nadkarny has claimed that my article is factually incorrect, I would rather believe the DAE version for I have cross-checked it with officials of AERB. It is not I but the AERB officials who have raised apprehensions about a hurried shutdown in the case of an emergency.

Nuclear technology was once described as a Faustian bargain which required a technological priesthood to maintain it. The members of this priesthood would have to be dedicated, pay meticulous attention to every single detail, and be incorruptible. Kumar Basu's reply throws ample light on the dismal condition of our 'atomic age brahmins'. AERB's job is to oversee the safety of all nuclear facilities. If its members think that RAPS-1 poses an unacceptable hazard, they ought to shut it down/pronto. If they feel powerless to do so, they ought to publicly resign and force the issue on the national agenda. However, to raise apprehensions in the public's mind while at the same time doing nothing about the situation is merely a reflection of their own lack of moral courage.

A Healthy Development

Consumer Education and Research Centre (CERC), Ahmedabad has called upon the Centre to inquire into the leakage of radiation from RAPP at Kota and to rehabilitate, compensate and prevent further occurance of such disastrous events.

In a memorandum to Mrs Maneka Gandhi, Minister for Environment and Forests, the CERC has said the leakage of radioactive tritium into the air and water is playing "havoc" with the lives of nearby villagers. Deformed children are being born to otherwise healthy women. According to the memorandum, the Commission of Inquiry should be presided over by a High Court Judge and should include two or three experts of Atomic Energy (not employees of RAPP), representatives, of voluntary organisations, environment action groups, experts from the Pollution Control Board of Rajasthan, radiologists, doctors and experts on radiation therapy for a detailed epidemeological survey.

It has also suggested that a panel to hear grievances and give relief should be constituted and provisions of insurance, medical coverage, payment of compensation towards negligent and indiscriminate disposal of hazardous radioactive water should be arranged for. The present medical facilities should be taken to improve them.

An Example from the Land of Bofors

On March 1st three Plowshares activists entered Swedish Ordinance's armaments factory in Eskilstuna, Sweden where they disarmed with hammers two so-called Carl Gustaf grenade throwers and one AK 5 automatic rifle. Sewdish Ordinance is a major producer of Swedish weapons and the largest share of its production is for export. In particular, the Carl Gustaf grenade thrower is distributed world-wide and was extensively used in the Persian Gulf.

The group, including Stefan Falk, Anders Grip and Per Herngren, calling themselves Armsfactory Plowshares, walked directly in the factory together with the morning shift's workers. To the surprise of the employees, the activists proceeded to disarm the weapons. While they were eventually hindered by the guards, the action was met by workers, guards, and later the police calmly and without any trace of violence. The three were put under arrest, charged with unlawful entry and property damage, and later released. The three are awaiting trial.

On March 2nd and 3rd follow-up civil disobedience actions were carried out by the support group. On Saturday, to the accompaniment of song, theater and a symbolic turning of the earth at the factory fences, four activists - Anders Grip, Per Herngren, Katarina Palmbald and Stellan Vinthagen climbed over the fences and were promptly seized by the guards and later handed over to the police. On Sunday the action continued, this time the group built hotbeds at the fences and were later apprehended by the police while attempting to climb over the fences. On both occasions factory security, the police and the mass media were given exact times for the actions. The four were charged with unlawful entry and damage to the lawns and were later released appending trial.

On March 5th Linus Brohult, Lars Gustafsson and Johan Hammerstedt were tried in Eskilstuna's district court for the March 20th, 1990 Plowshares disarmament of one Carl Gustaf grenade thrower. They are awaiting the court's verdict ....

Another Nail in the Coffin

A major new study at the U.S. Department of Energy's (DOE) Oak Ridge facility has found that workers exposed to even low levels of radiation had higher death rates from cancer than unexposed workers.

The study, published on March 20 1991 in Journal of American Medical Association (JAMA), concluded that the cancer effects of low-dose, slow-delivery radiation were ten times higher than seen in the population exposed by radiation from the Hiroshima and Nagasaki bombs. This lends new credence to the theory that long-term exposure to low levels of radiation is more hazardous than exposure to higher radiation levels in a short period.

According to the study, each rem of radiation exposure accounted for nearly 5% increase in the risk of fatal cancer. Workers at the plant were exposed to an average of only 1.7 rem over the entire course of their careers. Only 638 of the 8318 workers studied received over 5 rem during their careers. Five rem is the permissible annual amount nuclear workers may receive according to Nuclear Regulatory Commission (NRC) radiation standards.

The study included white men who worked at the plant between 1943 and 1972, and followed them through 1984. Earlier studies which covered worker through 1977, did not show cancer increases. The new study said that the excess cancers did not occur until after 1977.

The clear implication of this is that U.S. may be on the verge of seeing proof of increased cancers among all nuclear workers-including ones in the commercial industry. Because the commercial industry newer, cancers among worker would not yet be expected to show up. But the study's results suggest that future studies may be able to identify an increased cancer risk among nuclear workers.

Whether this will translate into evidence of increased risk among residents near nuclear facilities is unknown. The Oak Ridge study focused only on the plant workers, and the increased risk was found to correlate with increased exposure. It is important to note, however, that even the levels the workers were exposed to were quite low. For example, the average 1.7 rem exposure, over a hypothetical 30-year career, equals only about 55 millirems/year additional exposure - only about half as much again as the average background radiation exposure. This level is well below the average exposure level received by commercial nuclear workers.

The study gibes with several other radiation studies, including one conducted in 1977 by Dr Mancuso of workers at the Hanford nuclear facility, and a 1988 study of workers in the British nuclear weapons complex.

Workers at the Oak Ridge plant actually were found to have lower than expected death rates, even from cancer. This is believed to be due to the nature of the study population - well paid white working men, with access to health care and other social benefits. The significance of the study, however, is that within the study group there was a measurable correlation between increased exposure and increased fatal cancer risk.

However, the study did find that deaths from leukaemia were 63% higher than expected - a potentially staggering finding, especially considering that other death rates were lower than expected. However, radiation expert Dr John Goffman cautioned that the methodology and sample size of the leukaemia portion of the study were insufficient to make such an important statement.

Political fallout from the study could include renewed efforts to revise NRC's radiation standards for workers, and perhaps the general public, and even greater opposition to the proposed regulatory relaxation of radiation protection requirements. At the *very least, calls for similar, and ongoing, studies at other nuclear facilities can be expected to increase in frequency in the coming years.

The Department of Energy attempted to downplay the results of the study, but the best its spokesman could manage was to argue that cancer risk is low if doses are low and kept below existing permissible standards.

The study's primary authors were Drs Steve Wing and Carl Shy of the University of North Carolina at Chapel Hill.

The Nuclear Monitor: March-25,1991

Antinuclear Movement in Tartar Republic

One of the most important problems facing the population of the Tartar Autonomous Soviet Socialist Republic is that caused by the building of Tartar Atomic Power Station (TAPS). During this year some actions including demonstrations and marches against the building of TAPS have been held. Recently, Tartar Antinuclear Society has been created. It is the first organisation of this type in USSR. The organisation considers further use of nuclear energy to be absurd! In particular, we are trying to stop the construction of TAPS.

The fifth anniversary of the Chernobyl disaster is a reminder to us that nuclear energy threatens the survival of life on Earth. From year to year we have realised the different kinds of damage that has been caused by this catastrope. The number of sick people affected by radiation has been steadily increasing. This year the necessity to evacuate some more people from their homes has been revealed by the government. For more than three years, hundreds of thousands of people have been living in these regions at grave risk to their lives. The government announced that the damage caused by the accident has cost 10 milliards(billion?) roubles. But this year only Byelorussia has appealed for 17 milliards roubles to mitigate the awful consequences of this accident. It should be noted that the profit from all Soviet nuclear power stations totals just 2.5 milliard roubles. So, are nuclear power stations profitable? Vast areas have been spoilt for many centuries. Because of mismanagement, lot of foodstuffs from dangerous regions were sold to people.

The ruling circles often try to represent the Chernobyl catastroph as some kind of a natural calamity similar to, for example, the earthquake in Armenia. But there is a concrete criminal responsible for Chernobyl: It is the Atomic Energy Ministry. There is an urgent need to stop building any more nuclear power stations as has been done in many other countries. But, despite everything, the building goes on. Academician Velikhov has not abandoned his grandiose plans of atomic construction. Last year two atomic stations at Smolensk have been put to work. By the way, the Atomic Energy Ministry has taken 65 million roubles from the fund collected through voluntary donations from all over the country to help Chernobyl victims, to meet needs of its own.

The Tartar Antinuclear Society stands for alternative development. There are at present in the Tartar Republic and the country as a whole, lots of monopolies that dictate the putting of huge amounts of money into "the great projects" (nuclear power plants, cyclopian channels etc.) The real development of the national economy and the raising of the living standards of ordinary people is restrained by wasteful and uncontrolled use of natural resources. The export of gas and oil, as a result of colonial policy, will in the near future leave the country without strategic raw materials, the government intends to build new giant hydropower stations, *regardless of irretrievable harm done by such dams to nature.

An atomic power station is an especially dangerous object. The damage caused by its operation is enormous. The radioactivity of nuclear wastes is ten million times the activity of the initial nuclear fuel. The radioactive background level unavoidably rises, causing increases in the number of mutations and cancers. The threat of global biological degeneration produced by growing radioactivity becomes daily more real. Nuclear wastes require expensive store houses (burial grounds). Islands in the Pacific have already been turned into radioactive cemeteries for thousands of years.

In our opinion there are two ways to solve the energy problem. The first is to assimilate the energy preserving technologies, for today only about 10% of the produced energy is used effectively. The second is the exploration and elaboration of alternative energy source such as solar and wind power plants. Even in cold Sweden, solar energy has proved to be sufficient for lighting and warming. The Antinuclear Society does not restrict itself only to campaigns against nuclear power stations. We have organised a laboratory for research into alternative energy sources and also to monitor radioactivity in the environment. We also bring out a newspaper and organise conferences. But our main task right now is to stop the building of Tartar and Bashkir nuclear power station. Although the Supreme Soviet of Tartar ASSR has adopted a resolution to this effect, in April 1990, the central nuclear ministry will try to accomplish its plans. Because of this, our organisation together with active workers of Bashkiria intends to carry out a march against both stations on the 5th of July. We appeal to all people in our country and abroad for help in conducting this action.

Albert Garapov
President, Tartar Antinuclear Society
P.O.Box 90 Kazan USSR 420034

The Era of Mild Radium Therapy

The discovery and purification of radium by the Curies in 1898 fascinated the general public and scon became one of the great scientific media events of the 20th century. Here was an element that glowed in the dark and provided a portable and nearly inexhaustible source of powerful roentgen rays. Within a year of its discovery European physiologists were experimenting with radium and its daughter isotopes as treatments for cancer and various skin conditions.

This "Curie therapy" was hailed as a welcome addition to surgery, specially in the treatment of malignancies of the facial and genital regions where radical surgery was difficult, dangerous and disfiguring. Madame Curie won two Noble prizes and her trip to America in 1921 was transformed into a series of whistle-stop photo opportunities, which placed her among the heroes of the new age of technology. By 1927, radium was such an important part of the medical armamentarium that the Welfare Council of New York proudly drew attention to the fact that the hospitals of that city alone possessed more than 12 grammes of radium (worth almost $1 million) and were in the forefront of the development of new techniques in radium therapy. Every important medical school sought to establish a radium treatment center. Treatments were given in private telephone booth-sized cubicles concrete vault. By 1913, radium therapy was a well established medical subspeciality with thousand of patients being treated annually in the U.S. and Europe.

Mild Radium Therapy

Curie-therapy made use of the destructive powers of the beta and gamma emissions of radium and its daughter elements. The penetrating nature of these high-energy emissions made it possible to use sealed radium sources, arranged in fixed geometries within the tumour bed, to sterlize relatively large areas of cancer intested tissue. The dosimetric principles evolved by the early Curie-therapists paved the way for the current use of radiotherapy in cancer treatment.

However, in the early decades of this century another approach to radium therapy also arose which had its roots in the homeopathic and physical medicine movements of the late 19thcentury. Called "mild radium therapy" to differentiate it from the harsh destructive treatments of the cancer physicians, the approach was predicated on the idea that radiation when used in small doses, was a powerful metabolic catalyst.

A Physiological Role for Alpha Particle Radiation

The exact biochemical mechanisms through which radium exerted its salutary effects were hotly debated. Some said that radium compounds worked through direct end-organ stimulation. Others claimed that they worked by the destruction of microscopic toxins. Some others felt that radium worked indirectly by stimulating the adrenals or the thyroid. The only thing that the mild radium therapists agreed on was the physical *phenomenon primarily responsible for these effects; the heretofore ignored alpha particle emissions of the radium nucleus.

Alpha particles are large, relatively slow moving chunks of nuclear matter consisting of two protons and two neutrons. They possess tremendous energy and produce a dense cloud of ionization events when traversingmatter. Because they dissipate their energy so rapidly, they can only penetrate to a depth of 100 mm limiting the range over which they can exert their effects to about 10 cell diameters. This lack of penetration prevented their use in cancer therapy..

The mild radium therapists began with a different philosophic approach. They noted that throughout history, hot springs like those at Brambach in Germany, Ischia in Italy, and Sail-les-Bains in France had been touted as panaceas for a variety of ailments including rheumatism, cretinism, impotence, and melancholy. These salutary effects were achieved only when the waters were drunk or their vapours deeply inhaled. Bottled water from these springs rapidly lost its potency. The great German chemist Justus von Leibig attempted to analyze the waters from Gastein Springs, eventually ascribing their power to a dissolved gas with mysterious electricals effects. In 1903, the discovery was made that the apparent pharmacological agent in these waters was radon ("radium-emanation"), an alpha particle emitting gas with a half life of less than 4 days that was produced in decaying radium. Alpha-particle emitting isotopes, taken internally in minute quantities, were hailed as powerful natural elixirs capable of delivering direct energy transfusions to depleted organs.

The discovery of the tonic effects of radon water can be seen as the beginning of the era of radioactive patent medicines. Mineral water from hot springs had been used for many centuries with no evidence of any ill effects. The theory was that if the active agent in these waters was a radium isotopes, then long term use of small quantities of radium must be harmless as well. Many important European physiologists began to study the cellular and organismal effects of low-level alpha particle radiation. George Wendt in his address to the 13th International Congress of Physiologists in 1929, reported that human leukocytes exposed to low-level radium radiation began migrating toward the radium source and that moribund vitamin deprived rats could be temporarily rejuvenated by exposure to radium.

Radium truly seemed to be the basis for the fountain of youth legends, and because it was considered a natural element rather than a drug, it was available over the counter and was not regulated. By 1913, the parenteral and oral use of low dose of radium was well established in the treatment of rheumatism, gout, syphillis, anamia, epilepsy, multiple sclerosis and other chronic diseases. One physician reported that from 1913 to 1921, he personally had given over 7,000 injections of radium, in doses ranging from 10 to 100 u Ci each. Pharmacopoeias from the 1920s listed dozens of patent medicines that supposedly contained small amounts of radioactive materials. Paradoxically, most of the governmental regulatory intervention in the growing field of radiopharmaceutical nostrums was limited to prosecuting patent medicine manufacturers whose supposedly radioactive preparations were found to give off only background levels of radiation. The discovery in the late 1920s that many young women had worked as radium dial painters were developing bone cancers, sounded a cautionary note to the medical world, but apparently not to the radium devotees who convinced themselves that these problems were due to impurities in the radium paint rather than to the radium itself.

The End of the Era of Radioactive Patent Medicines

The era of radioactive and alpha particle emitting liniments ended abruptly on March 31,1932. On that day a shriveled anaemic patient named Eben MacBurney Byers finally died of multi-system failure, the victim of a mysterious but relentlessly progressive syndrome involving multiple areas of skeletal and soft tissue necrosis, metabolic wasting and bone marrow dyscrasia. *The New York Times* reported the preliminary finding of an investigation into the death under a headline, "Eben M. Byers Dies of Radium Poisoning".

America was at that time in the grip of the Great Depression, and the death of one more poor industrial radium dial worker would not have been front page news. But Byers was a millionaire, an internationally known industrialist, a sportsman and a playboy. He began the final radioactive chapter of his life after falling out of the top berth of a train in 1927 and hurting his arms. Over the next few weeks, he began to complain of chronic musculoskeletal pain and a general run down feeling that was affecting his athletic (and it was rumoured, his sexual) perfomamance. Byers was adviced to try Radithor - a radioactive wonder drug invented in 1925 by the self-proclaimed radium expert William J. A. Bailey of Bailey Radium Laboratories, East Orange, New Jersey.

Byers began drinking several half ounce bottles of Radithor each day from early in 1928 and until October 1930. He claimed to feel invigorated and restored and recommended Radithor enthusiastically to his high-society friends. He sent cases of it to his business partners and girlfriends and even fed it to his racing horses. Radithor was expensive, each bottle costing a dollar, but what was that to the wealthy members of Byer's social set ? The Radithor promotional literature was filled with "testimonials" from great physiologists of the day. And also, Radithor was "absolutely guaranteed harmless".

About two years after he had begun taking Radithor, Buyers told his personal physician that he had lost "that toned up feeling." He began to lose weight and complained of headaches and toothaches. Eventually his teeth began falling out. A radiologist in New York, looked at Byers radiographs and noticed some similarities in the lesions with the descriptions of radium dial painters, Byers' body was slowly decomposing, the result of massive radium intoxication from the Radithor.

Some physicians disagreed. The Radithor that Byers had consumed had contained only tiny amounts of radium, each bottle certified to include microgram quantities of a mixture of "radium and mesothorium in triple distilled water." Many believed that such tiny quantities were innocuous, being cleared from the body before they could accumulate. Radithor was widely used : if it was so dangerous, why had not these effects been reported before?

Since Byers was a millionaire and a prominent citizen, the wheels of the government began to grind. The Federal Trade Commission (FTC) launched an investigation into Radithor and in September 1931. Byers was called to testify. He was too ill to travel and so an attorney, Robert Winn; was sent to his Southampton mansion to take the deposition. He later described the scene:

"A more gruesome experience in a more gorgeous setting would be hard to imagine. We went to Southampton where Byers had a magnificant home. There we discovered him in a condition which beggars description. Young in years and mentally alert, he could hardly speak. His head was swathed in bandages. He had undergone two successive jaw operations and his whole upper jaw excepting his two front teeth and most of his lower jaw had been removed. All the remaining bone tissue of his body was slowly disintegrating and holes were actually forming in his skull."

Byers autopsy revealed that he suffered from the necrosis of the jaw, swollen kidney cortex, cerebral abscess, hyperplastic regenerative bone marrow and bronchopneumonia. His breath, bones and viscera were all highly radioactive; despite the fact that he had taken no Radithor for more than a year.

William J. A. Balley

Attention now focused on the Bailey Radium Laboratories and its founder, head scientist and chief executive officer, William John Aloysius Bailey. Bailey disagreed with the diagnosis of Radithor induced radiation poisoning, declaring, *"I* have drunk more radium water than any man alive, and I have never suffered any ill effects." The next day when health officials tried to obtain further information they found that Bailey had left town.

Bailey's involvement with the pharmaceutical industry began somewhere around 1918. That year he was fined $ 200 plus costs for fraudulently promoting the "Las-I-Go- For-Superb-Manhood' patent medicine. Chemical analysis of these pills which were advertised as a potent aphrodisiac; revealed that the active ingredient was strychnine. Sometime in the early 1920s Bailey became interested in radioactivity and became president of a company called Associated Radium Chemists Inc. This company produced a line of radioactive patent medicines including Arium, a tablet and Linarium a radioactive liniment. Bailey was also listed as the inventor of another brand of radioactive pills, Thorone Tablets, which were marketed as a treatment for sexual impotence.

Among other devices that Bailey invented were the Radioendocrinator, a small readiactive chip that "ionized the endocrine system.'the Bioray, a radioactive paperweight that would supply "a steady flow of gamma rays without any fuss or bother," the Thoronator; a radon water charging device for producing radioactive water in home or office; and the Adrenoray, a cure for impotence that consisted basically of a radioactive belt clip. Some of these devices were sold for as much as $ 1,000 apiece, and all apparently found a ready market in the RoaringTwenties. Bailey later claimed that it was the Great Depression, rather than the Federal Trade Commission, that eventually caused him to get out of the radioactive patent medicine business.

Bailey died of bladder cancer on May 16,1949. He had reached the age of 64, an astonishing feat of longevity for someone who claimed to have consumed more radium water than any living man, it is perhaps ironic that his final contribution to the literature of mild radium therapy came almost two decades after his death, when his bones were exhumed as part of Massachusettes Institute of Technology/Argonne National Laboratory study on radium physiology, his remain revealed extensive radiation changes and were still quite radioactive when studied in 1968.

With the realization that the magnitude of radon problem is greater than had been previously appreciated, interest in the health effects of low-level alpha particle exposure has been rekindled. Some critics have suggested that these radon health risks are being overstead and that low-level long term exposure to this "natural" isotope is unlikely to cause much harm. Before crediting this line of argument, we would do well to review the history of the rise and fall of mild radium therapy in the early decades of this century.

Dr Roger M. Macklis
Excerpts from a paper in JAMA Vol. 264,
(August 1,1990)

News From Kerala

Work is proceeding on a war footing to establish a nuclear power plant at Peringome, about 18 kms eastwards of Payyanur in Kannur district of Kerala. Site selection is presmumed to be almost confirmed and acquisition proposals are on. Simultaneously, the proposed construction of Kakkadavu Irrigation Project, shelved for the past two decades, owing to the public agitation, is being taken up again with the singular objective of providing cooling water to the Peringom power plant. There will not much need for large scale evacuation of people from within the 1.6 km radius 'exclusion zone' since it is at present itself, government owned rocky land. The authorities have been extremely careful in suppressing all information, so that the likelihood of any immediate revolt against the proposal can be averted. Survey work and other activities have been carried out at night and various government departments have already provided vital information, calld for by the nuclear power authorities. This plant is almost certain to materialise, especially as there is positive feedback from a section of the population.

Apart from several villages, highly populated cities and towns with lakhs of people, come within 30 km radius of the proposed plant. *Inspite of this majority of the people seem to be rather indifferent to this nightmarish prospect. People clamouring for so called "development" and "progress" are openly campaigning for the plant with promises of abundant electricity and employment.

We seek your solidarity and support in spearheading a strong movement against the proposed palant. We propose to do hectic campaigning during the next few weeks followed by an antinuclear workshop-camp at Peringome on Chernobyl day. All kinds of audio-visual materials like slides; posters; films and song cassettes will be very useful to us. We seek the presence of all antinuclear enthusiasts in the camp to be held from April 26. There is a great need for resource persons and display material, so that the people can be awakened from their blissful ignorance and complacency. A nuclear power plant should never come up in such a densely populated state as Kerala, where even the International Atomic Energy Agency specifications can never be fulfilled.

We have become active in antinuclear activities again. You may have learnt about the meeting we organised on October 2, 1990 at Kottayam. It was very successful and effective. About a thousand people participated in the programme including some very eminent persons like Dr U. R. Ananthamurthy, the Vice Chancellor of Mahatma Gandhi University.

Kerala Government had continued to maintain perfect silence over the plans regarding the proposed new nuclear power plant in the state. This made us feel that they were dropping the idea as there had been state-wide protest on the issue. New suddenly, after the District Council elections are over and the Left Democratic Front has won a massive success, they are again pressing this idea. Already a state level seminar, in which people like Dr. P. Klyengar and a number of "official scientists" participated; has been conducted at Ernakulam. They have also decided to hold such seminars at all district headquarters in the state.

We too, have started the counter campaign. We feel that right now there is a great need to concertrate on the semi-urban and rural areas of the state. One such corner meeting has already taken place at Kuravilangadu. Two of us Mr. M. J. George and Mr. Jacob spoke there.

Mr. Rajagopal, a very active member of our group and the staff reporter of the daily *Mathrubhumi* was recently given an award for environmental journalism by the State Committee on Science and Technology of the Government of Kerala for his article, "Pollution in Kerala." The award was presented to him at the State Science Congress '91 which was held at Calicut. He received the award and then returned it back to the committee. In his speech, he said, "When our government and science organisation will show integrity by deciding against the installation of the nuclear power plant, he will take the award. We organised a gathering yesterday at Kottayam to accord him a reception.

Now that we have decided to move into the villages, we feel the need for an effective poster exhibition. Any ideas, pictures, cartoons for it would be of great help. Also, have you or anybody else prepared a list of nuclear accidents in India and what is happening to Indian nuclear waste ? Where are they dumping it ?

Abey George
Ayamkudy, P.O. Mathuchiva
Kottayam, Kerala.

REVIEW

The Fire in the Rain
The Democratic Consequences of Chernobyl
Peter Gould
The Johns Hopkins University Press, Baltimore

When the Greek forces finally did overcome the Trojan resistance after resorting to the trick with the "Trojan Horse", they were intoxicated with victory. In their arrogance with their own cleverness, they forgot the Gods who had made it all possible. The Gods punished them by sending storms in the sea in which most of them perished. The Greek word which describes this kind of arrogance -- which leads to ultimate disaster - is hubris.

Peter Gould's book on the democratic consequences of Chernobyl, is a book which describes the hubris of modern civilisation. After successfully wresting the secrets of the atom, modern man is no less intoxicated with cleverness, but disaster awaits.

In many ways, this is indeed a splendid book. It's main theme is the political fallout that followed the radioactive clouds over Europe. How nations with different political systems reacted to this unforeseen threat. How they tried to 'manage' the crisis - the suppression of news; the deceptions practiced by 'experts'; the bureaucratic games played with great skill in the 'democratic' countries like Britain and France and with brute unfeeling force in countries of Eastern Europe, are all there in the book - the various strands gathered by a "shepard" of the intellectual world and presented in a way that brings order and meaning to data and allows lessons to be learnt. Woven into this masterly presentations are technical interludes - in which the author tries to make the subjects of reactor physics and radiation biology intelligible to the lay reader in order to answer the question, "what actually happened at Chernobyl."

These technical interludes are well done - they may not be as authoritative as some others by experts, but they do take the lay reader across the main difficulties likely to be encountered while attempting to make sense out of rads and rems and positive "reactivity co-efficients" and such like. Thus, this book is an important addition to the growing literature on Chernobyl and one that ought to be read widely. It's choice of subject matter, though of vital importance, is one that is not often discussed in other publications.

However, I am unable to give the third full thoroated cheer to the book for it suffers from a serious flaw, - it's last chapter. Peter Gould's dilemma is best put in his own words :

"Chernobyl brought us face to face with a dilemma and if any good may be said to have come from the catastrophe it is the possibility that it has opened the path for reflective thinking once again. The dilemma comes from the fact that it is not easy to think prudently, for the choices are agonizing. We have built a civilisation on energy. Our movements, our food, our communications, our material comforts ...... all require prodigious amounts of energy, and we have fallen into profligate habbits. Even the stability of nations, and therefore the world system made up by them, becomes questionable when energy sources are suddenly placed in jeopardy. If civilisation is to continue to unfold in more humane ways, the energy to fulfil the hopes and necessities of civilised life must be there. The sheer pressure of people on energy resources and a fragile environment lies behind this horn of the dilemma."

Gould's way out of the crisis is the next nuclear chimera - inherently safe reactors. He does not realise that Hiroshims, Bhopal, Chernobyl, the Gulf war,... are all names of the same crisis. The crisis produced by profligate habbits and a way out needs one to reflect on how to give up these habbits. This is a fatal flaw in this otherwise fine book.

.... !!!

Investigator I have only a few questions.... You were not at the power station at the time, were you?

Director I wasn't able to be, but I was at the very beginning.

Investigator Did you realise at once what had happened?

Director More or less. In general terms.

Investigator And you left the station?

Director I, er, temporarily absented myself. You see...

Investigator I know. Your grandchildren were alone at home.

Director I saw that work was in hand to extinguish the reactor. My son's mother-in-law lives in a village nearby, eight kilometers away. I thought I'd just dash over to the village, leave my grandsons there and come straight back.

Investigator But why didn't you alert the whole town? Then they could all have dashed out into the country, even if only, say, five kilometers up-wind. They could have gone that far on foot. It only needed an announcement on the local radio to notify everybody. There was no need for them to wait those twenty-four hours until the official evacuation order was given.

Director It's not as simple as that.

Investigator But to put your grandsons into your car and drive away - that was simpler was it? After all, you knew better than anyone else what had happened. Yet children were still playing football in town *this morning.* And freshly picked cucumbers were being brought in and sold on the streets...

Director I couldn't get back. You know why. They must have told you.

Investigator Yes - a silly accident. Your car skidded off the road and got stuck on the verge for a quarter of an hour. Fortunately, your grandsons didn't get out of the car. Yes, I know about that. And on the way back you were stopped and detained for a medical check.

Director I had driven right through the "dirtiest" area of the fallout.

Letter Box

An Invitation to Join Indranet

We feel sure that you are concerned about the mounting turbulence of our present time; the increasing distruction of all life support systems, the spectre of global climatic change, the sharpening communal tensions, the shameless politics, the rapid degeneration of our culture and the hundreds of other problems that beset us. The aftermath of the Gulf War and Bush's agenda for a new "world order" is added cause for alarm, if only because the global arm twisting will be more blatant. Millions of people already pauperized by "modern development" will be further marginalized.

A number of activists and other individuals; concerned with social justice and sustainable development, have expressed the need for urgent action in this critical situation. One of the suggestions was the formation of a network which will provide for mutual support, for access to sources of information and for a forum for discussion.

There is an ancient Indian story that Indra weaved a vital net, with a pearl at each node. Each pearl symbolizes a single individual and each pearl reflects the light received from all the others.

Our aim is to build just such a living network. Each person's contribution, no matter how little can significantly help other individuals and greatly enhance the collective influence. Hence this invitation. We would be happy if you join us as a participant in Indranet.

If you are interested in joining the network, we would like to know more about you personally : your interest, your background, your hopes and fears. We would also appreciate having information on your work and organization, if any, its genesis, its aims, its achievements, the problems it faces, the areas in which you need support or in which you can offer some help or guidance. Others will surely benefit from this information. This information and other suggestions by network members will be published in a newsletter.

The network is being run by Maharashtra Prabodhan Seva Mandal at present, but members willing, could be made independent. There is no membership charge but donations to cover costs of paper and postage and to unable us to reach more people are most welcome. Each individual in an organisation can also be a member. If you agree with what we are doing, do try and get others involved in the network.

Winin Paceica
Maharashtra Prabodhan Seva Mandal
79 Carter Road,
Bandra. Bombay 400050.

You will be happy to know that we had a good meeting on Women's day (March 8, 1991) on the subject of the Kaiga nuclear power plant. Dr. Kusuma came as an invited speaker and there was a slide show and a short video film on the subject of environmental at Kaiga.

We are planning a series of publications on the various nuclear power plants in India which we want to bring out in time for the April 26th conference at Bangalore. The Bookstore is planning to put up a special sale of nuclear related publications at this conference. We already have books on Narora and Shivaji Rao's Silent Killers, etc. and we are preparing booklets on the others, for example Kaiga, Koodankulam and Kalpakkam.

However, we do not have material on Rawatbhata and Kakrapar. The booklets are planned as a mixture of reports, articles and some press clippings on agitations. The purpose is to provide information on the plants to those who might be interested. We believe that the antinuclear stance is hotting up and we must take advantage of this to push if further. Therefore, if anybody has any reports, documents, reports of agitations etc. on Rawatbhata or Kakrapar could these please be rushed over to us.

Mr. Norma Alvaces
The Other India Bookstore
Above Mapusa Clinic,
Mapusa, Goa 403507.

EDITOR'S NOTE :

By the time this issue *of Anumukti* reaches you, it would be rather late for sending material to Ms. Alvares to meet the April 26th deadline. However, I feel that even though these booklets may not be ready in time for the meet, they ought to be published all the same, since they would fulfil a very strongly felt need. Therefore, I would request all *Anumukti* readers to help in this cause.

I am using back issues of *Anumukti* to draft a solidarity resolution highlighting the shared concerns of Bhopal and the antinuclear movement. I think that it is important that we publicize these issues as interconnected.

Also, we are planning an Earthday (22 April) rally in Madras to initiate renewed focus on the Eveready Boycott. (Union Carbide's manufacturing facility is in Madras.) We shall be spending the week before the rally visiting Madras organisations to mobilize participation. There is also a great need to mobilize support in Madras for the protest against both Koodankulam and Kalpakkam.

Kim Laughlin
Eklavya, E-l/209Arera Colony
Bhopal 462016.

Already a lot must have been said about Nuclear Power Corporation's advertisements in *Sanctuary.* Still I want to add my little bit.

The reasons which propel Nuclear Power Corporation to give ads in a magazine like *Sanctuary* can be some of the following:

1. The readers get misinformed and 'follow the line'.
2. The readers get the impression that *Sanctuary* does not hold a view strongly opposed to nuclear power.
3. Nuclear Power Corporation can use *Sanctuary's* name in campaigns of the type "Even these people accept us."

If all these objectives can be unambiguously defeated, I feel there is no harm in taking the ads. Some might doubt if this can be done. I believe that Nuclear Power Corporation's designs can be defeated. If I was to do it, I would :

1. Invite reaction of Anumukti or similar group and print it on the page next to the advertisement.
2. As editor, write a note saying "We oppose nuclear power and also this advertisement campaign which is spreading disinformation... We thank Nuclear Power Corporation for sponsoring this issue in which we plan to expose their hollow claims" (All this should be done after providing prior intimation to NPC.) If even after that, NPC wants to give the ads they ought to be welcomed.

The activists/researchers at times get rather fussy about such issues. One reason may be the fear that a fast buck can corrupt the value system. However if such guidelines are followed while accepting advertisements, this can be prevented. In fact, with such guidelines in operation, chances are that organisations like Nuclear Power Corporation will never give advertisements to magazines like *Sanctuary,* in the first place.

Have you printed any posters? Do you plan to? A3 size posters of two colours can be both effective and affordable. (It would cost around Rs. 2.50? per poster for a print order of 500 posters.) In case there is interest in this, I can take responsibility for sale of posters worth Rs. 200/.

Girish Sant
cIo Dr Kulkarni
Amrita Clinic, Athwale Corner,
745 Deccan Gymkhana
Pune 411004

While travelling in a bus from Jamshedpur, I encountered a very interesting person who works as a machine operator with the Department of Atomic Energy. He is middle-aged and had worked previously at Jaduguda Nowadays, he drills out samples of mineral at various probable sites. At present they are working very close to my village. There are three such sites-Rangamati, Galudih (near Raj Kharsawan) and Sanjay. During our conversation he told me that his son aged about 6 cannot talk and had been examined by doctors at various places including the Tata Memorial Hospitals at Jamshedpur. The Tata Hospital's report mentioned was that the son had a defect in the brain. What struck me was the possibility that the defect in child's brain may have something to do with the radiation absorbed by the father in the course of his work. Therefore, it would be very useful if a sample survey could be conducted in the area to see if there are many other cases amongst the workers involved in nuclear mining. I'll be very happy if I could be of any help in conducting such a survey. I have also noted down the person's name and home address.

Dr Mangal Mahato
School of Physics
University of Hyderabad
Hyderabad 600134

Please accept my felicitation on your excellent editorial 'The Road From Hiroshima" and a very good issue of *Anumukti* Vol.4 No.4. February/March 1991. You have provided good coverage on nuclear issues and problems both within India as well as abroad.

Citizens for Alternatives to Nuclear Energy (CANE) is organising a three days workshop on nuclear energy and people's movements from April 26th to April 28th, 1991 at Bangalore, as you had announced in the last issue of *Anumukti.* In view of national elections, it will be an excellent opportunity if we all meet at Bangalore and make it into a National Convention Against Nuclear Power. It may also be appropriate to prepare a manifesto/resolution' a GREEN Manifesto from Bangalore Convention which will be presented to all political parties and asking the electorate to vote for only those candidates who agree to our demands of a moratorium on nuclear power and nuclear weapons and also agree to provide more funds for non-conventional sources of energy and for the protection of the environment.

Dhirendra Sharma
Committee for a Sane Nuclear Policy -•
M -120, Greator Kailash-I,
New Delhi 110048

My wife and I have been travelling in India to visit our friends and relatives. At Malati Devi Choudhuri's house we came across an impressive copy of your periodical *Anumukti.* Having been involved in providing information questioning the wisdom of building additional nuclear power plants in Britain, we were glad to see the dangers ahead set out clearly.

The size of the construction contracts and the secrecy surrounding semi-military decisions make your task particularly difficult.

Nicholas Gillet
Oakcroft, Cross on the Hill,
Maples. Cheshire SY148DH U.K.

Just today (April 4, 1991) I heard on the B.B.C. radio that there has been an increase in the number of deformed children born in the vicinity of Rajasthan Atomic Power Plant at Rawatbhata. (See "Chernobhata" in *Anumukti* Vol. 3 No.6 June/July, 1990-Editor). British television has shown a film which was secretly made regarding this and the increasing cases of sterility amongst the youth of the area. It also gave reference of some government doctors who refused to say anything probably due to fear of administrative action. All this is definitely the outcome of your hard work and continuing efforts. I feel certain that these efforts shall prove effective and be fruitful.

Rampratap Gupta
Government College, Rampura
District Mandasur M.P.

I learnt from *Janosatta* (Hindi) that a team of doctors and experts from the Bhabha Atomic Research Center had been to Rawatbhata for investigating the very high incidence of diseases over there. Their findings were that the diseases weredue to the ignorance, carelessness and superstition of the villagers. The news item also mentioned the denial to this issued by Shri Ratanlal Gupta, the Sarpanch of Rawatbhata. He said that if this was so, then why have the diseases increased after the opening of the nuclear power plant since ignorance and superstition have been present for ever. It is necessary that an independent investigation of these diseases be carried out quickly. A group known as Socially Active Medicos from Indore has also shown some interest in this but somebody has to take the responsibility of organising it.

Sunil
Kisan Adivasi Sangathan
Kesala, Dist: Hoshangabad M.P.

Subscription Rates :

Rs. 25/- ***per*** *year South Asia*
U.S. $ 15/- *per year air mail overseas*
(Rs. 200/' per year if paid for in India)
Lifetime Rs. 250/- (only within India)

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist.: Surat, 394641 INDIA

Editor : Surendra Gadekar
Subscription, donations, manuscripts, enquiries regarding circulation should all be addressed to :

Published by S. Gadekar for Sampoorna Kranti Vidyalaya and printed by him at Parijat Printery, Ahmedabad, typeset by Parijat Shah & Associates, Ahmedabad.

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ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 6 June/July 1991

Step by Step into Pluto's Embrace

The Indian atomic energy programme was begun by visionaries, who set their sights high. Nuclear energy was to be that magic talisman which would wipe the tear from every eye, make the deserts blossom and ensure for the country her rightful place in the community of nations. How ever much fault one may now (with hindsight) find with their judgment and with some of the elitist presumptions that underlay that judgment there can be no denying of the fact that these people were indeed visionaries who dared to dream.

The picture, that the whole programme presents today is an altogether different one. Patriotic idealism, comradery, enthusiasm for the challenging tasks ahead are all now well and truly a thing of the past. Gone into oblivion along with the noble dream. Today, visionaries have been replaced by mercenaries; who dare not dream but only scheme. The whole accent is: make your pile while the going remains good.

One of the latest examples of this selfish, short-sighted and profoundly anti-people attitude is the proposal by the Atomic Energy Commission to accept spent nuclear fuel from other countries for reprocessing here. Seen from the nucleocrat's point of view this proposal has some attractive features. Presumably, it will earn some foreign exchange and in our present desperate state this carrot alone will make the political leaders' mouths water and be sufficient to obtain their consent. Secondly, it will present an occasion to tom-tom their own 'great' achievements — how India is only the fifth or maybe the eighth country in the whole world able to master this 'complicated' technology. And thirdly, the proposal neatly covers up the fact that there is today an idle overcapacity in the country as a result of past mistakes in planning.

What the whole operation would involve is the transport of radioactive wastes from research reactors in other countries to India, the separation of plutonium from these wastes over here and the reshipment of the separated plutonium and the residual solidified wastes back to the country of origin. The dangers involved are many: First and foremost is the risk of theft: Just two kilograms of separated plutonium in a bomb can cause massive destruction and thus these shipments to and fro would be a great attraction to all kinds of terrorist groups. Second, is the risk to ordinary citizens posed by those trying to safeguard against the thefts: While the disaffected groups may or may not attempt nuclear dacoity, the police and paramilitary apparatus of the state is certain to attempt a major robbery — erosion of the civil rights of the citizen — all in the name of providing 'nuclear proof security. There would be an exponential rise both in the size of the coercive state apparatus as well as in the draconian and arbitrary powers it would assume for itself..

Third is the risk, nay the certainty, of environmental damage. Reprocessing plants are bigger polluters than nuclear power plants, since the work involves mechanically and chemically breaking up spent fuel rods and thus releasing most of the volatile radioactive nuclides trapped inside. Large amounts of highly radioactive liquid wastes are produced during the process. Other countries doing reprocessing have all found difficulty in managing these wastes and areas around reprocessing plants in different parts of the world, whether in U.S.A., Russia or U.K. are all badly polluted. (See "Back to the Land" on page 5 of this issue.)

Last is the risk posed by nuclear transport of materials over potholed roads and under the prevailing driving conditions, about which senior nucleocrats including two former chairmen (H.N.Sethna and Raja Ramanna) had this to say just seven years ago in a paper presented at an international symposium in Vienna:

"Economic considerations would warrant a large-capacity fuel-reprocessing plant, centrally located, along with the required radioactive waste management capability. But in a highly populated, developing country such as India, the logistical constraints, in terms of an adequate transportation network of suitable standards and other infrastructural requirements need to be reckoned with. For instance, movement of irradiated fuel over railways can pose a problem as the track-widths adopted varies along the route. Similarly use of roadways could be cumbersome, as in certain areas the load bearing capacity of the existing roads is inadequate for the carriage of heavily shielded consignments."

What one would like to ask these worthies and their successors is; in what way has the infrastructural difficulties eased over the last seven years for them to contemplate large-scale transport of radioactive waste products all over the land? Have the roads become any better today? Or have the drivers become suddenly less accident prone?

Reprocessing of spent fuel is done in Trombay and at Tarapur while another plant at Kalpakkam is almost ready. The earlier hare-brain notion of having a reprocessing plant each at all nuclear power plant sites has apparently now been given a quiet burial. Since the nucleocrats are determined to provide the 'benefits' of nuclear energy in the concrete form of nuclear power stations to all parts of the country, that would have essentially meant sacrificing vast areas to waste. However, the new strategy of moving radioactive waste around is certainly no improvement. And to be moving not only our own waste but that of foreigners as well for little bits of money just indicates complete intellectual as well as moral bankruptcy.

Plutonium is an aptly named material. Pluto is the king of the underworld. Over the last forty years we have been slowly but inexorably marching towards his kingdom. Our goals have become ever more modest, our sights have been fixed lower and lower as befits a nether world people. One can almost predict the next proposal that our nucleocrats will come up with. A few years further down the road with the foreign exchange position even more precarious they would solve the hitherto insoluble nuclear waste problem. After all, West - the repository of all the good things of life including nucleocrats' children - should not have to deal with this problem at all. What are we for! India has vast land areas and stable geological formations where all this waste could be safely stored forever, as long as that precious foreign exchange keeps trickling in.

Surendra Gadekar

Anumukti deeply regrets the sudden and untimely demise of Shri Bhaidas Parikh, a member of the Gujarat Anu Urja Jagruti and a staunch friend of Anumukti. His calm presense, sage advice and unstinting help in times of need were a great support to us all. His absence would be keenly felt.

The Beginning in Bangalore

Antinuclear groups in India have been somewhat like the village republics of old — independent, self reliant and isolated from each other. The three day workshop from April 26 to April 28,1991 held at the premises of the Indian Social Institute and organised by Citizens for Alternatives to Nuclear Energy (CANE) group was an attempt to braid the various strands together. There is no doubt at all that the organisers' hard work was crowned with success. All participants at the end of the three days felt closer to each other, and part of a nation-wide movement. Many new friendships have been forged, contacts established, concrete proposals of mutual help put forward. All these would be of great help in the days ahead in finally halting the nuclear steamroller from stumbling on.

More than sixty participants came from different parts of the country. Besides Karnataka; Goa, Gujarat, Kerala and West Bengal were well represented. There were also some friends from Tamilnadu, Bombay, Orissa and Delhi. The absence of representatives from around Rawatbhata, Jaduguda and Narora was most keenly felt. The imminence of general elections prevented groups from Andhra Pradesh from attending which too was a great pity.

Not only did the participants come from very different backgrounds, they also had very divergent expectations from the meeting. These ranged the whole gamut from, "How this meeting can help to close down Kaiga," and "What can be done to build a model alternative;" to "Can nuclear energy be used for good purposes without hazards in the Indian context. However, by and large, the expectations of the participants could be divided into four broad categories:

- Strengthening contacts
- Exchanging information and sources of information
- Bringing nuclear energy to the forefront as a live public issue
- Gettingbetter educated about the nuclear issues as well as about alternatives

The organisers tried to satisfy all these expectations by keeping the programme schedule rather flexible and by breaking up the gathering into a number of small groups so that all would have a chance for self-fulfillment and expression. The only sacrosanct timings were the meal times, so that the workers who prepared and served the meals would not be inconvenienced. An example of the flexibility and accommodating nature of the organisers was forthcoming even before the meet formally began; since a number of participants expressed a desire for some form of direct action to mark Chernobyl day, the organisers scrapped the scheduled programme. The first afternoon and the evening were spent in taking out a protest march from the venue of the conference to the offices of the Nuclear Power Corporation. The rally ended by presenting a short memorandum to the officials present there exhorting them to join the movement and save the world from a repetition of the Chernobyl horror. Needless to say, these worthies remained unmoved! Afterwards there was a street play performed by participants from Uttar Kannada.

The meeting was formally inaugurated by a retired justice of the Karnataka High Court, Justice Nittu Srinivas Rao. The first morning was spent in getting acquainted and in to analyzing the various strategies and actions used by different groups in trying to raise awareness among various special interest groups such as for example students and legislators and lawyers.

The first programme on the second day was a talk by Prof D.K.Subramanium of the Indian Institute of Science. Prof Subramanium gave a very fascinating description of the vast scope available in India regarding energy conservation and how by being more efficient India could eliminate the need to develop most conventional new sources be they coal, oil or nuclear.

This talk was followed by an information exchange session with the participants breaking into three groups; one on nuclear energy, the other on movement strategies and a third on alternatives.

The afternoon session was spent by various groups in conducting a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of their own movements and then reporting the results to the plenary. The rest of the afternoon and evening was taken up by a 'media strategy' session. In this session each group presented their most effective programme to raise public awareness. These comprised of poetry, drama, talks, slideshows and dance. This session was extremely useful since it allowed different groups to open up and share their talents and thus come closer together.

One of the major shortcomings of the meet was that it did not provide enough time for various groups to talk together — a lot of time was spent in talking within groups. Many complained during the evaluation on the last day that had discussion been more structured, it would have been more beneficial. The organisers had expected this give and take between groups to take place informally during free times. This did happen a lot and yet there was dissatisfaction on this score—another indication of the extent of earlier isolation amongst the various groups and their keenness to pool their strengths together.

After dinner times were meant for slide-shows and video presentations. First evening, there was an extremely animated discussion which lasted till past mid-night following a slide presentation on the condition of the people around Rawatbhata and the screening of a video film, 'The Price of Power," dealing with the same subject. The second night there was a slide show by Nagesh Hegde on nuclear power followed by films on the Narmada movement, "Save Water—Save Life March," and on the Indian Rare Earths plant at Alwaye in Kerala.

The last day was occupied fully in forming plans for the future. There was great interest in closer cooperation and there were many suggestions made for achieving it.

Some of the proposals which elicited a great deal of discussion were:

- Making antinuclear movement a strongly women's oriented movement:
  Since nuclear energy is a direct threat to a woman's right to motherhood and having healthy children, some participants felt that the movement should have a women's oriented focus. Not everyone (not all of them men) agreed with this emphasis. However, there was general agreement that special efforts were needed to raise awareness amongst women. In this connection Dr Kusuma (Contact address: Snehakunja, Kasarkod, Taluka Honnavar, Dist: Uttara Kannada, Karnataka) agreed to be a focal point of a women's action programme.

- Collecting reliable data on the health effects of Indian nuclear power stations:
  One of the major shortcomings of the antinuclear movement in India has been the almost total dependence on foreign data The need to generate an Indian data base was strongly felt and expressed by many. As a first step in this direction it was decided to hold a proper study of the health condition of the people living in the vicinity of Rajasthan Atomic Power Plant at Rawatbhata. A preliminary meeting to decide upon the methodology of the study was scheduled in Bombay on the 15th and 16th of June.

- Raising public awareness:
  Suggestions included taking delegations of neighbours of proposed sites of nuclear power plants to Rawatbhata, so that they could see and experience for themselves the kind of havoc even 'safely' operating nuclear power stations cause in their immediate vicinity. There were demands that the slides and pictures of the people around Rawatbhata, be made available to each group so that they could be widely displayed. (In this connection the Anumukti group has already distributed five sets of slides to different groups from various parts of the country.) The need to conduct local workshops in small towns near nuclear power stations was also widely expressed. There was a suggestion that dates like the Hiroshima-day and the Chernobyl-day be specifically reserved for such local activities by activists and national level programmes be taken up during other times. Another proposal which had a great deal of support was for simultaneous cycle marches to Kaiga by various antinuclear groups from different parts of the country. However the logistics of these need to be worked out.

- **Better intercommunications:**
  How to achieve better communications between various groups took up a lot of time. It was decided that this task be divided into two. Coordination between various groups would be the responsibility of CANE while information exchange be conducted through *Anumukti*. *Anumukti* should publish a proposed date of publication of the next issue and a last date for receiving communications. There should be a separate column in *Anumukti* for such group communications.

- **Available Resources:**
  Claude Alvares from the Goa group said that they had facilities for publishing books in English. They were already bringing out small booklets on various nuclear power plants and would like to make that an ongoing project. They also had an assured distribution network. The Gujarat group said that in Sampoorna Kranti Vidyalaya at Vedchhi, they had **a** very good training centre where young activists could come for short times to get trained both in nuclear issues as well as in non-violent forms of protest. Participants also wanted a list of all the resource material whether they be books, papers, slides, films, or videos available with all the groups in the country. Satish (Contact Address: CISEC, Kottamukku, Quillon-13 Kerala)agreed to compile such a list and to send it to the various groups on request. It was also decided to make a common slide show comprising a selection from Nagesh Hegde's slides on nuclear energy, the *Anumukti* groups slides on the health condition of people around Rajasthan Atomic

Power Plant and the Kerala groups slides on the health effects on people living in high-background radiation zone in Kerala.

- Liaison with other movements
  One point of total unanimity was the realization that nuclear power plants are just one head of a many headed monster called 'development', and regarding the need to fight this monster on many fronts. One example was provided by the group from Goa who said that the greatest threat to the social fabric and the environment of Goa was from the depredations caused by modern tourism with its five star hotels and luxury holiday resorts. Groups in Goa plan to use the nearness of the Kaiga nuclear power plant as a means to discourage tourists from coming to Goa.

The concluding function of the meet was a public meeting in Gandhi Bhavan at which a retired chief justice of the Karnataka High Court, Justice D M Chandrashekhar, presided.

Back to the Land:

The Sea-to-Land Transfer of Radioactive Pollution

While the British nuclear lobby have ceased to deny that they have made the seas around Britain the most radioactive in the world, they continue to insist that this is having no impact on the health of those who live or work on or near the sea. But research by the nuclear industry into the effects of the marine discharge of man-made radioactivity has been characterized by the use of inefficient technologies and mischosen sites for monitoring and analysis, and has been undertaken against a background of basic ignorance about the behaviour of radioactivity in the sea.

For some forty years, the British government has turned logic on its head and allowed the nuclear industry to discharge radioactivity into the sea in complete ignorance of its consequences. The little knowledge that has been acquired about the dilution and dispersal of radioactivity in the sea has been gained only by monitoring the radioactivity after it has been discharged.

High incidence of childhood leukaemia found near the coastal nuclear plants at Sellafield, Dounreay and Hinkley Point have been linked to the radioactive discharges from these sites. But the link is by no means clear cut; indeed if *conventional* dose-risk estimates are used, the *reported* levels of radioactivity released from these plants could not be responsible for the leukaemias. However, the conclusive epidemiological studies of these leukaemia clusters rely on absolutely sound data. There needs to be a definite understanding of the dose-risk estimates, the amount of radioactivity entering the sea and the behaviour of radioactivity in the marine environment, as well as an efficient programme of monitoring. Unfortunately, none of these conditions are being fulfilled.

Understanding the Marine Environment

To understand the dispersal and dilution of radioactivity in the coastal waters there must be a thorough knowledge of the system of currents in the relevant sea areas. Yet the definitive *Atlas of the Seas around the British Isles,* admits that for all British waters "the main overall weakness in the study of water column movement is the lack of systematic, long term data collection in almost all areas." For the Irish Sea, this lack of data means that the authors can say no more than "it would appear that more often than not there is a South to North flow to the West of Isle of Man." For the region in the vicinity of the nuclear installations at Sellafield, Chapelcross, Springfields, Capenhurst and Heysham this definitive work says "the circulation shown for the region is still a matter for argument."

Knowledge of the residence time of the pollutants in any given sea area is similarly vague. According to the International Council for the Exploration of the Seas, the fate of pollutants is dependent on the environmental conditions at the time of the release and for a few months afterwards. The large variables of wind, current and even river input spread over extended time periods, makes estimates of residence times extremely unreliable.

After a large leak of radioactive crud into the Irish Sea from the Sellafield pipelines in 1983, site operators British Nuclear Fuels admitted that nothing was known about how the radioactivity was likely to disperse. Irish Sea Project, an independent research group conducted a number of studies to test the

Reprocessing

At the moment a reactor is shut down its spent fuel contains some 450 synthetically produced nuclides, including plutonium-239. The method for chemically separating this plutonium-239 from uranium and its fission by-products is known as reprocessing. These methods were originally developed during World War II to provide highly purified plutonium for atomic bombs.

Uranium, neptunium and plutonium are members of a series known as the actinide series of elements. Their chemical properties are similar to the lanthanide series of rare-earth elements. Early studies revealed that plutonium had chemical properties that varied with its oxidation state and could thus be exploited for separation processes. These properties included the solubility of plutonium phosphates and fluorides in aqueous solutions (compared with the insolubility of the phosphates and fluorides of the fission products) and the fact that certain plutonium ions could be extracted with organic solvents.

The fission products are isotopes of elements ranging in atomic number from 30 (zinc) to 66 (dysprosium). Most of them are radioactive with half-lives that range from less than a second to thousands of years. The fission products are the chief source of heat and radiation from spent fuel. A dozen or so combine intense radiation and long half-life with chemical and physical properties that are troublesome in reprocessing or in the ultimate disposal of the wastes.

The first step in the treatment of spent fuel is to store it for several months in water filled pools at the nuclear power station. During this period the radioactivity and the evolution of heat decrease by a factor of about 10,000. The uranium oxide elements that fuel power reactors are encased in long, slender tubes, made of either stainless steel or of an alloy of zirconium called Zircalloy. Such rods are prepared for processing by chopping the tubes into short sections and dissolving out the oxide ("chop-leach.")

The "Purex" process, which is the most commonly used reprocessing method all over the world, employs TBP (tributyl phosphate) dissolved in a kerosene like hydrocarbon as the separating agent. When uranium and plutonium ions are highly oxidized they are more soluble in the TBP solution than they are in an aqueous solution. Under the same conditions hundreds of fission products are more soluble in a strongly acid aqueous solution than in the organic one. The process involves making the aqueous and organic solutions to flow in opposite directions through a column or some other kind of a mixing chamber that disperses one of the solutions in small droplets through the other. Thus the solvent can extract uranium and plutonium in their highly oxidized forms from the aqueous feed solution which contains most of the fission products. In separating the plutonium from the uranium, the plutonium is reduced to its trivalent form making it insoluble in the solvent which then contains all the uranium.

potential movement of water column and its associated radioactivity. These studies showed that the radioactivity released could travel further and faster in the sea than had been previously guessed, and that such radioactivity might concentrate and remain in coherent masses over a period of months. These coherent masses could be trapped in certain types of coastal locations for even longer periods.

Incomplete Discharge Data

Ministry of Agriculture, Forests and Fisheries regularly publishes an *Aquatic Environment Monitoring Report,* which contains what purports to be a definitive list of the discharges of liquid radioactive waste from UK nuclear establishments. This data is far from complete.

It is inevitable that sites as complex as nuclear establishments will suffer from accidental leaks. The 1983 pipeline leak was only discovered because Greenpeace protesters were working off the end of the pipeline. BNF was able to make only approximate assessment of the radioactive contents of the leak. BNF was also unable to deny that there had been such incidents in the past.

BNF also discharges solid radioactive wastes into the Irish Sea including pieces of contaminated work gloves, bits of highly radioactive bitumen, and particles of radioactive stainless steel from nuclear fuel pins or reactor cores. Since the dumping of solid wastes into the marine environment is currently subject to a moratorium, there is no official record of these wastes.

In February 1979, a serious leak of radioactivity was discovered at Hinkley Point, Somerset. This was escaping via a site drain which was inspected only once every six months. The authorities guessed that the leak might have begun on the 8th or perhaps the 17th of January. Incidents of this nature occur every year at British nuclear establishments, and because of bad site design and lax attitudes to on-site and pipeline monitoring, it is almost always impossible to obtain information on the duration and radioactivity content of the leaks.

Other contributors to man-made marine radioactivity are radioactive cargoes lost at sea, as well as nuclear-powered warships that routinely discharge at least six nuclides in significant quantities. There are also "non-nuclear" sites that produce radioactive waste by-products which are flushed into the sea.

Plutonium-241

Plutonium-241, a beta emitting radionuclide, was originally thought to be unimportant in terms of human radiobiology and was consequently discharged into the sea in unlimited and unqualified amounts. It is "guesstimated" that, up to the end of 1982, some 550,000 curies of this substance had been discharged from the Sellafield pipeline alone. It is now accepted that plutonium-241 presents a risk to human health in its own right, and, more seriously, plutonium-241 decays to produce americium-241 which is both a beta and an alpha emitter. Americium-241 is considered to be 2.5 times more hazardous than even the most dangerous of the Plutoniums. Americium accumulates in marine sediments and silts and in living organisms. It is particularly prone to being incorporated into seaspray and so transferred back to the land.

British Nuclear Fuels has paid compensation to the dependents of two former radiation workers who died of cancer. The payments were announced in a joint statement issued by British Nuclear Fuels Ltd. and the General Municipal Boilermakers and Allied Trades Union. In one case a payment of just over £ 21,000 was made to the dependents of a former employee at Sellafield, who died of lung cancer in 1976. No details of the other case have been released at the request of the dependents.
Source: **atom:** *Journal of United Kingdom Atomic Energy Authority (March 1991)*

Limits have now been imposed upon discharges of both plutonium-241 and americium-241. in 1988, for example, the total discharge of americium (including that due to plutonium-241 decay) was around 45.5 curies. In comparison it is estimated that americium production in Irish Sea silts resulting from the decay of historically discharged plutonium-241 will peak towards the end of 21st century, by which time plutonium decay will be contributing approximately 1,300 curies a year into the Irish Sea.

Behaviour of Marine Radioactivity

The two nuclides which make up the greatest percentage of discharges from reprocessing sites are tritium and caesium. They both dissolve and become evenly distributed into a water-body. This "diluted and dispersed" radioactivity is reconcentrated in the marine environment by a number of mechanisms. Human body absorbs 100 percent of the tritium in water through the skin, and 100 percent of the tritium in water or water vapour is inhaled. Tritium reconcentrates in the human body, particularly in the fat cells. In laboratory studies on animals, it has been shown to cause an increase in lymphosarcomas, as well as an important level of incorporation into DNA, RNA and proteins. Tritium is difficult and expensive to monitor in environmental samples so the regulatory authorities do not take up such monitoring.

Caesium on the other hand is easy and cheap to monitor. Like tritium it is ubiquitous throughout the marine environment which it has entered as a result of weapons test fallout, and accidents and gaseous and liquid discharges from nuclear plants. Monitoring by the authorities and independent groups has proved that caesium reconcentrates in the marine food chain and in estuarine and marine sediments, and blows ashore with seaspray and water vapour. Caesium from the sea can be found in the grass and lichens at least 10 miles inland in South Wales and even more in Cumbria. Caesium reconcentrates in the muscle tissue and reproductive organs of marine and land mammals, and is transferred via mother's milk to offspring (who prior to weaning show much higher body burdens of caesium despite their shorter exposure time.)

Sediment Behaviour

All nuclear installations discharge alpha emitting radionuclides of the actinide series—the plutoniums, americium and curium. Sellafield makes the major contribution to the British waters and its signature can be detected as far away as Scandinavia.

Since actinides are heavy elements it was originally assumed that they would settle and would be trapped in the sediments off the end of the discharge pipelines. However, in a 1977 enquiry, it emerged that the contaminated sediments off the end of the discharge pipelines were subject to a host of phenomena including dredging, trawling, earthquakes (several in the Irish Sea over recent years)and storms. By 1989, the responsible authorities had only just begun to construct models of marine sediment movements; models which do not include any input for specific storms, but only for an "average effect."

The averaging of such data irons out the peaks of radioactivity in the environment. Such a peak occurred in February 1990, when extreme storm conditions breached sea defences and deposited hundreds of tonnes of marine sediment in the streets and houses of the town of Towyn in North Wales. Of the fourteen samples of this sediment analysed for radioactivity , eight contained Sellafield derived actinides at levels which exceeded by more than ten times the official levels at which further investigation is required. This event has certainly led to the inhalation and also ingestion of actinides. Yet, as far as the official data-gatherers are concerned, it remains unrecorded.

Microlayers and Aerosoling

As the liquid waste from nuclear installations tends to be warmer than the ambient sea temperature, discharge plumes tend to rise towards the sea surface. The plumes contents are therefore available for incorporation into the sea surface "microlayer." The microlayering phenomenon occurs when the sea surface layer, only thousandths of a millimetre thick, becomes enriched with very fine sedimentary material. When the sedimentary particles are exposed to radioactive contamination, the microlayer concentrates the surrounding levels of radioactivity. Irish Sea microlayers, for instance, have been observed to be enriched with plutonium and americium by factors of four to five.

Microlayers themselves cause a second set of phenomena called "aerosoling," which allows for the transfer of radioactive materials from the sea to the air by a number of mechanisms including bubbling, evaporation, and wave break in the open sea and in the surf line. Seawater-to-air aerosoling enrichment factors are enormous. The breaking of waves along the shoreline has been observed to produce aerosols with an enrichment factor of 812 for americium.

Silt Monitoring

If there is no understanding of the dispersal patterns of man-made radioactivity in the sea, then there can be no proper assessment of where to monitor.

The village of Garlieston is the only official monitoring site on the coastline of Wigtownshire in South West Scotland. It is on the evidence of this *one* site that conclusions are drawn about the effect of radioactivity on the population of over 120 miles of coastline. Samples taken from silt deposits in the Cree estuary by the environmental group Radioactive Survey for the People of Wigtownshire, gave a maximum reading for americium of 715 becquerels per kilogram. The maximum activity for the same nuclide a few miles away in the stony-bottomed harbour at Garlieston was only 40.5 Bq/kg. A similar pattern was noted for plutonium and caesium.

It is therefore likely that some people on the Wigtownshire coast have for many years been exposed to much higher levels of radioactivity than official reports indicate. Despite being fully aware of both the Cree/Garlieston discrepancy and evidence from the Institute of Oceanographic Science that estuaries and mudflats are likely to have the highest marine radioactivity levels, the authorities have failed to adjust their monitoring practices.

> *There is no doubt that the very high concentration of man-made radiation in estuaries is a significant source of sea-to-land transfer. Yet, none of the UK studies of sea-to-land transfer are conducted near the silts of estuarine headwaters.*

Monitoring of Sea-to-Land Transfer

Most of the UK Atomic Energy Authority's (UKAEA) research on sea-to-land transfer of actinides has relied on the use of continuous high volume air samplers and muslin screens. Both the technology and the methodology are deeply flawed.

The muslin screens are usually deployed to catch airborne particles on or near the surfline of open coasts. The high volume samplers, which draw air through an aperture positioned one metre above ground level, are sited inland of the screens. Because of the many inaccuracies inherent in the use of muslin screens (especially in winds above force five, when the material in the screen stretches and its porosity increases) a 1982 UKAEA report concluded that they should be used "only as a qualitative tool to compare relative concentrations of actinides in seaspray."

Despite this warning muslin screens have been used repeatedly in recent studies by UKAEA into human exposure by inhalation to actinides coming off the Irish Sea.

Muslin screens were first used in the early 1980s because the high volume air samplers are "not properly suited" to sea-to-land transfer studies, "and are believed to be not very efficient for relatively large particles" which may be found in seaspray. Yet, the UKAEA responds to criticism over the use of muslin screens by arguing that the results from the screens are supported by the use of the high volume air samplers.

Inland Penetration of Radioactivity

There is ample evidence that seaborne radioactivity is penetrating inland and entering the human food chain. Independent analysis have repeatedly confirmed that caesium-137 from Sellafield sea discharges on pasture grass and tree lichens more than ten miles from the coast. A pre-Chernobyl study from the Hebridian island of Uist showed that caesium-137 was present in almost every type of island produced food.

> *1 ne population of the coastal zone is breathing in potentially significant doses of radioactivity particularly in periods of strong winds.*

In spite of the evidence that this sea-to-land transfer is affecting crops grown up to 10 miles inland from UK coasts, the authorities insist that the only pathway for the ingestion of seaborne radioactivity is through the consumption of seafood. They also disregard the certainty that the population of the coastal area is breathing potentially significant doses of radioactivity, particularly in the periods of strong winds.

A Continuing Experiment

In 1958, John Dunster of the UKAEA openly admitted that the authority had intentionally discharged "substantial amounts of radioactivity" into the Irish Sea to monitor how it would behave in the marine environment Dunster stated:"... the aims of this experiment would have been defeated if the level of radioactivity discharged would have been kept to a minimum." This experiment is continuing, though it has been grossly mishandled and the resulting data is totally inaccurate.

The time is now ripe for a review of "experimental" discharges of radioactivity into the environment. The industry should no longer be allowed to expand further, in complete ignorance of the realities of seaborne radioactivity and its effects on human health.

Tim Deere-Jones
This article is an edited version of the full article which appeared in The Ecologist Vol.21 No.l (January /February 1991) This article quotes many references and I would urge activists to study the original in the Ecologist.

Russian Roulette

It should have been an idyllic scene. Across the river in the spring sunshine, a lush meadow led gently up to a cluster of old wooden cottages nestling under the woods. That was the picturesque Bylorussian village of Old Gromyko, by a strange chance where "Mr Nyet" was born—Andrei Andreyevich Gromyko, who was to become his country's long-serving foreign minister and later president.

On our side of the river lay New Gromyko, which had its share of picturesque wooden houses, but also a fair number of brick and breeze-block buildings. Down by the river two boats rested half in the water. A heron flew overhead—there are fish galore in the river. Behind a tuft of grass a black and white cat lurked hopefully, knowing that on boat held four small fish.

"See it off," Nikolai Gromyko (everybody is called Gromyko round here) told his four year old son Sasha, who waddled over to the cat, his legs so bowed that he could hardly run. It all seemed so normal. Sasha grinned. "I did it, didn't I?" he said as the cat ran off.

But if he stays any longer in this village, Sasha is doomed. Already his bow legs testify to a serious vitamin deficiency, He has heart trouble as well. His eldest brother has serious anaemia, and may be taken abroad for treatment — one of the lucky ones.

Sasha, his four brothers and sisters, his father and mother, are seven of *theonly 40 or 50 people left in New Gromyko, about 15 miles northwest of Gomel. In Old Gromyko there are only two - living in an intensely radioactive zone, fatally contaminated by the fallout from the Chernobyl reactor that exploded five years ago.

They should not be there. The government says that anyone living in a zone contaminated by 40 Curies per square kilometre or more must leave. Old and New Gromyko have 120 Curies per square kilometre.

So why are Nikolai and his family still there?

"We did move," he said. "I found a job as a tractor driver in a clean zone, but they paid me only 80 to 90 roubles a month. I couldn't feed my family on that, so we came back."

"Back here," where nobody should be living, the government pays people 30 roubles a month as compensation, so he gets 210 roubles. Not enough after the swinging price rises, but better than 80 or 90. So he sows radioactive potatoes and catches radioactive fish to help feed his family.

"What can I do?" he asked. 'If I take them away, they will die quickly of starvation. If I stay here, they'll die slowly of radioactivity." Nearby Bortolomeyevka is another ghost village. Doors and windows hang loosely from their hinges in a sinister silence. Windows are curtainless and blank, as if blinded by the radiation. In places radioactivity reaches 160 to 170 Curies per square kilometre.

The only things to be seen were a couple of cats, a mangy dog or two and some hens scratching at the ground — and then suddenly half a dozen old people were clustered round the well.

Nina Sokolova burst into tears at the question. "There is nowhere to go, and I'm so frightened," she wailed. "We can't use the well and now they have turned off the water." She pointed to a standpipe. "What are we to do?"

A lorry rumbled round the corner up the street. 'That's the bread lorry," explained Nina's husband Yegor through his few teeth. "It comes only once or twice a week now."

Nina sobbed: "We went to Gomel and asked at least for a room, and the boss just threw us out of his office."

Now 70, but looking nearer 90, Nina was taken to work in Germany during the war. Her husband fought in the Red Army, and they married when she came home. One son lives in Gomel, but his wife will not have them.

We drove away between rows on new solid houses. 'They were built a year or two ago," said Natalya Bobrovskaya, "and no one's ever lived in them. Last year they tarmacked the village road. Just think what they could have done for the children with that money. And last year they harvested crops."

Now the fields are deserted. But for several years radioactive meat from the Gomel region was being sold all over the Soviet Union. Five years ago, 70 percent of all the radiation from Chernobyl fell on Byelorussia and 53 percent of it on the Gomel region. The disaster caused more than 800 times as much fallout as from Hiroshima and Nagasaki together.

According to Dr Vladimir Pinchuk, head of the Children's Clinic No 1, the incidence of cancer related diseases has risen 20 -25 times in the past five years. There are thyroid gland disorders, leukemia, anaemia, lung cancer, deformed births, still births, you name it.

John Rettie
Guardian Weekly, May 5,1991

GOIANIA: THE BHOPAL OF BRAZIL

I September 1987 in the central Brazilian town of Goiania, a neighbourhood and its occupants were contaminated with caesium-137 after a lead box containing the stuff in powdered form was found in the ruins of a former radiation institute. (See *Anumukti* Vol.1 No.3). The box was taken to a scrap metal dealer, where it was opened. Apparently people were fascinated by the powder's luminosity and took some home with them and passed it on to friends and neighbours. The six year old daughter of the scrap dealer was so thrilled with it that she applied the powder all over her body. As a result of the contamination, 40 people were hospitalized and by October 28th, four had already died including the daughter of the scrap dealer.

According to the government's present figures, the box contained 19 grams of caesium and it contaminated 118 people in all. In addition it left behind more than 15 tonnes of radioactive waste that would need to be preserved for at least a century and a half. However, these figures are quite different from those which came out at the time of the accident. The reports had then claimed that approximately 100 grams of caesium was involved and at least 243 people were said to have been contaminated.

Whatever the government's figures, three years and four months after the accident, an investigative journalist, Bolivar Figueredo, found the victims abandoned by the state and federal authorities to cope with the difficulties arising from the accident totally on their own. According to an article published in *Agora SP* Figueredo reported that the foundation which had been created to provide medical assistance to the victims, had become practically defunct having received no assistance from the government for the last several months.

The Association of Caesium Victims has recently released a report entitled 'Three Years of Agony and Pain." It describes how people are presently categorized as being highly contaminated by the National Commission on Nuclear Energy (CNEN). The contamination levels are determined by the officials themselves and are based on who they have determined can hold someone else for a certain number of minutes "safely"—that is, without contaminating the other person. Among these highly contaminated victims are 45 children. The victims are badly treated and used as "guinea-pigs" by both Brazilian and foreign scientists. 'They stay for 10 hours inside a laboratory undergoing various examinations. Blood samples are collected and sent to scientists all over the world. However, when we ask for details regardingour situation, nobody explains anything to us at all," says Torezhina Fabiano, a member of the association and mother of two contaminated children.

In October 1987, one month after the accident, the radioactive waste was transferred to Abadia de Goias, located 20 km from Goiania. This hasty transfer was authorized by the regional government and the CNEN. At the time the waste was taken to Abadia de Goias, the official bodies had declared that this was a purely temporary measure-no more than three months maximum. However, even today no alternative has been established by either the CNEN or the Secretary of Strategic Affairs, whose duty it is to protect the security of the population of Abadia de Goias, even though there have been large number of complaintss regarding contamination.

Brazilian environmental groups have been publicizing the hazards posed by and the urgent need for maintenance of the radioactive waste deposit. Already, there have been complaints and accusations from the local residents. There are reports of mysterious deaths amongst cattle and other domesticated animals, who die alter loss of hair, nails and after a severe diarrhoea. As there has been no logical explanation and much less technical assistance, even simple scratches and wounds are being blamed on the caesium waste dump.

For the moment, the choice for the waste dump is still open. Brazilian officials have made announcements to the effect that the choice would be made within a month. However, when it comes to action, nothing is being done. The nightmare continues ...

WISE News Communique 354, June 14,1991

PROTEST

Greenpeace activists blockaded a train carrying two casks containing spent fuel rods at Dunkerque in France. The casks were to be loaded on board the train and passenger ferry "Nord Pas de Calais"at Calais.. Twenty people chained themselves to the casks and delayed the trannsport for 16 hours. Others painted skulls and the slogan, "Return to the Sender" and unfurled banners saying "Stop Nuclear Transport" in French, English and German.

In February of this year, the Dutch government has enacted a defacto moratorium on transport of nuclear fuel in ships such as the "Nord Pas de Calais", which are not specifically designed to carry highly radioactive freight. This moratorium makes Dunkerque the last port in Europe from which nuclear spent fuel can be transported on **a** non-purpose built ship.

Many groups, including Greenpeace have pointed out that the practice of shipping nuclear waste on non-purpose built ship is especially dangerous. The group also points out that the International Transport Workers Federation as well as the European Parliament have both passed a resolution calling for an immediate ban on transporting nuclear cargo on non-purpose built ships. But despite such calls, ships such as "Nord Pas de Calais" continue to transport spent fuel from reactors in various European countries to the port of Dover in UK. From there it is transported by rail to the Sellafield reprocessing plant on the west coast of Britain. In this particular instance, the spent fuel was from the German reactor at Unterweser.

Wise News Communique 353

Editor's Note:
Indian nucleocrats—the guardians of our safety—have been indulging in this practice of shipping radioactive waste in non-purpose built ships for long. Just before the gulf war began, they shipped a flask containing 40 irradiated elements of highly enriched uranium aboard a cargo ship "Vishva Parijat". This ship passed through the gulf two days after the beginning of hostilities. (See "Vices of Gambling" on the last page of this issue.) The irresponsibility of this action is enough to take one's breath away!

The transport of large amounts of radioactive waste which the decision to do reprocessing of spent nuclear fuel from abroad implies, needs to be seen in this light.

The Cat and Mouse Game in Iraq

I seems that even four months after the bombardment of nuclear facilities in Iraq, the picture of what exactly happened to those facilities and the nuclear materials stored in them is still not precisely clear. According to an official Iraqi statement to the International Atomic Energy Agency (IAEA), Iraq had tried to move its nuclear material out of the facilities at Tuwaitha before the expiry of Security Council deadline of January 15,1991. But it was "not fully successful" in preventing the destruction of all its nuclear material. "Nuclear materials had been shifted during the war from locations known to the Agency to near-by locations, thus avoiding the possibility of a nuclear accident and any risks including radioactive contamination. This was done under very difficult conditions, owing to intensive air raids against their original locations, which caused loss of life and equipment and exposure of personnel to high radiation doses." Sometimes the material was moved around from one place to another at Tuwaitha, but that location was also bombed.

Twenty-eight fuel rod assemblies (a total of 5.6 kg of the 80% uranium) was still under the ruins of the destroyed reactor. No radiation release has so for been detected from this fuel. First reports spoke about some 93% enriched uranium which was still in the Tammuz-2 research reactor when it was destroyed, but this was later denied. A nuclear material store at Tuwaitha, which was also destroyed, contained nearly 1,200 kg natural uranium powder and pellets, 771 kg of samples of natural uranium fuel bundles and 55 kg of natural uranium fuel rods containing 30 kg of nuclear material. All this material is claimed by Iraq to be covered by rubble from the store and Iraqi experts have noted "radioactive contamination of the region." IAEA officials are said to be puzzled by the contamination, since Iraq reported only natural uranium in the store when it was destroyed. Nothing

HIT LIST

Research reactor IRT-5000	Completely destroyed	Measurements do not show radiation leakage
Tammuz-2 reactor	Completely destroyed	Measurements do not show radiation leakage
Experimental fuel fabrication laboratories and annexes	Completely destroyed	Measurements show presence of radiation contamination
Separate nuclear materials store	Completely destroyed	Measurements do not show radiation leakage
Radiochemical laboratories	Completely destroyed	Measurements show presence of radiation contamination
Radioactive waste treatment station	Completely destroyed	Measurements do not show radiation leakage
Chemical research laboratories	Completely destroyed	
Chemical analysis laboratories	Completely destroyed	
Radiation protection laboratory	Partially damaged	
Nuclear physics laboratories	Completely destroyed	
Yellowcake production unit (Al Qaim)	Completely destroyed	

Source for this table: The letter of 27th of April from Iraq to International Atomic Energy Agency.

about the observed levels of contamination has yet been reported.

Almost 12 kg of 93% enriched fuel, four kg of 80 % enriched fuel, one kg of 36 % enriched fuel and 87 kg of 10 % enriched fuel was removed from Tuwaitha center to an unknown place nearby. Iraq says it is willing to inform the IAEA in "greater detail" after receiving "your guarantee" because of "continued violations of the Iraqi air space."

In the list of all nuclear installations (24 in total) the Iraqi authorities have sent to the IAEA, the yellowcake production facility at Al Qaim, near the Syrian border, is the only installation mentioned that is outside of the Tuwaitha complex. This installation has also been fully destroyed. Rumours about a uranium hexafluoride conversion plant at Al Qaim are still unconfirmed; it is not included in the list. Also, no mention is made in the list of a centrifuge laboratory in north Baghdad, nor of a factory which makes centrifuge components northwest of Baghdad. Both had been cited by a German engineer who visited Iraq in 1988. There are supposed to be more facilities in the Jebal Qaras jok Mountains (near the Turkish Border). These are said to include a uranium mine and an enrichment plant. These locations too are not included in the Iraqi list.

The situation in Iraq has prompted discussions regarding the IAEA's system of safeguards. The discussion has mainly focused on the frequency of IAEA inspections but there has also been controversy regarding the definition of an SQ (Significant Quantity-the minimum amount of fissile material necessary for constructing a nuclear explosive device.) An SQ as presently defined by IAEA is 8 kilograms of elemental plutonium or 25 kg of elemental uranium-235. The official report from Iraq indicates that Iraq does possess more than one SQ of highly enriched uranium. Countries with SQs are inspected more frequently by the IAEA than the normal twice yearly inspections. So, if the IAEA knew that Iraq had more than an SQ of uranium, why were they not inspecting more often? On the other hand, if they were ignorant of the fact, it is further proof that inspections do not fulfill their purpose. In fact, after its inspection of Iraqi nuclear facilities in November last year, the IAEA had declared that Iraq did not have an SQ of highly enriched uranium.

But now, even the IAEA definition of an SQ has become a matter of dispute. The 25 kg quantity for uranium comes from a UN study of 1968. ONe official said that the IAEA took the Un figure over "because it doesn't have any weapons designers of its own. IAEA director Hans Blix has said that, "only the weapons states can competently answer the question of how large an SQ really is.

At the meeting of the IAEA Board of Governors in February, Blix said that the established definition of SQ "has important implications for safeguards approaches. If the tenet were to no longer give adequate confidence, it should be reexamined." However, if the SQ for highly enriched uranium were to be lowered to say half its present value, then more inspections by IAEA would become necessary according to its own rules. Already IAEA's inspection budget is under great pressure, and IAEA is rarely able to meet its own targets for inspection of small facilities such as those in Iraq. Also the decision will have great repercussions on sample size, since if SQ were to halve, inspection sensitivity would have to double.

Wise News Communique: 354

DEEP DISASTERS

Nuclear Warheads and Reactors Lost in the Seas

There are fifty nuclear warheads and eight nuclear reactors on the ocean floor as a result of 11 naval mishaps. Of these Soviet Union has contributed 43 warheads and five reactors whereas U.S. contribution has been seven warheads and three reactors. All eight reactors are sunk in the North Atlantic Ocean. A Soviet "Charlie"-class submarine which sank in the Pacific in 1983 and was subsequently raised is not included here. Of the sunken warheads, some 42 are in the Atlantic, the rest in the Pacific.

Unfortunately, this inventory of nuclear reactors and weapons may be an underestimate. It is not known if the Soviets have intentionally dumped decommissioned reactors in the oceans, or whether they have lost nuclear weapons in over water transit or during operations that did not involve the sinking of a vessel.

The New York Times of 27 September, 1974, reported that the Turkey's semi-official *Anatolian News Agency* said that a Soviet Kashin class guided missile destroyer exploded and sank in the Black Sea with no survivors sometime in early to mid September of that year. It has been reported by Greenpeace that Kashin class vessels can carry nuclear powered surface to air missiles and nuclear torpedoes. However, qualified sources at the time doubted that the destroyer was carrying nuclear weapons since it was on sea trials and in theory no such vessel would be carrying nuclear weapons.

On 7th of April, 1989, a Soviet Mike class submarine sank some 312 miles off the coast of northern Norway after a fire and explosions. According to Soviet announcement it was armed with two nuclear torpedoes. This indicates that Soviet ships do carry nuclear weapons even when participating in experimental or training operations. (The Mike submarine was one of a kind experimental submarine.)This makes it more plausible that there were nuclear weapons on board the Kashin class ship.

Similarly, the Royal Navy might also be missing nuclear weapons. During the 1982 Falklands War, Argentina sank two nuclear capable destroyers, the HMS Coventry and HMS Sheffield. Since then reports in the British press have repeatedly claimed that one or both ships carried nuclear weapons. These doubts have still not been definitely put to rest.

A List of Events

10 March 1956:

A U.S.Air Force B-47 bomber carrying two capsules of nuclear materials for nuclear bombs fails to meet its ariel refuelling plane over the Mediterranean Sea. An extensive search fails to locate any traces of the missing aircraft or crew. Where the accident occurred in the Mediterranean is still unknown.

18 April l959:

The U.S.Navy dumps the sodium-cooled liquid metal reactor vessel and the reactor plant components of the nuclear powered attack submarine USS Seawolf into 9,000 feet of water about 120 miles off the Delaware-Maryland coast. The *Boston Globe* reported on 17 May, 1980 that the U.S. Navy had been unable to find the reactor vessel and the barge with which it sank during a search in the 1970s. The Navy refused to give details about the search but merely claimed that by 1980 about 90 percent of the original radioactivity had decayed.

4 June 1962:

A nuclear test device atop a U.S.Thor rocket booster falls into the Pacific Ocean near Johnston Island after the rocket has to be destroyed as part of the United States' first high altitude atmospheric nuclear test attempt. The missile was destroyed minutes after liftoff and the debris fell into the open sea without a nuclear explosion.

30 June 1962:

A second attempt to detonate a nuclear device in the atmosphere fails. The Thor rocket booster is destroyed and the device falls into the Pacific Ocean. Although the official press release of the incident claimed that the "debris fell into the open sea and there was no danger to test personnel," a *New York Times* newsreport claimed that the missile was destroyed two minutes after launching and some of the debris rained back onto Johnston Island and another nearby island. The warhead was in the one megaton range and possibly contained a few pounds of either uranium-235 or plutonium-239. This hit the ocean in several chunks. Reportedly the ocean is three miles deep where the pieces sank.

10Aprill963:

The nuclear powered attack submarine USS Thresher sinks in about approximately 8,500 feet of water some 220 miles east of Cape Cod, Massachusetts, Killing all 129 on board. It was powered by one S5W nuclear reactor.

5 December 1965:

An U.S. A-4E Skyhawk attack jet loaded with a B43 nuclear bomb rolls off an elevator of the aircraft carrier USS Ticonderoga and sinks in 2700 fathoms of water about 250 miles south of Kyushu Island, Japan.

HAprill968:

A Soviet Golf class diesel powered ballistic missile submarine with three SS-N-5 missiles and probably two nuclear torpedoes sinks in the Pacific about 750 miles northwest of the island of Oahu, Hawaii in some 17,000 feet of water.

21 - 27 May 1968:

U.S. nuclear powered attack submarine USS Scorpion sinks 400 miles southwest of Azores in more than 10,000 feet of water, killing 99 crewmen. It was powered by one S5W nuclear reactor and carried two ASTOR nuclear torpedoes.

12Aprill970:

A Soviet November class attack submarine experiences a nuclear propulsion casualty while operating in heavy seas approximately 400 miles northwest of Cape Finesterre, Spain. After failing to rig a towline to a Soviet block merchant ship standing nearby, the Submarine sinks. It was powered by two nuclear reactors and probably carried two nuclear torpedoes.

6 October 1986:

A Soviet Yankee I class nuclear powered ballistic missile submarine with 16 SS-N-6 missiles (two warheads each) and probably two nuclear torpedoes, sinks 600 miles northeast of Bermuda in some 18,000 feet of water. A fire and explosion in the liquid fuel of a ballistic missile led to the sinking. The submarine was powered by two nuclear reactors.

7 April l989:

A Soviet Mike class nuclear powered attack submarine experiences fires and explosions and then sinks some 312 miles off northern Norway in approximately 5,000 feet of water. It carried two nuclear armed torpedoes. The Soviets claimed that the full content of the reactor's 17 kilogrammes of uranium fuel was spent and thus the reactor contained about two kilogrammes of plutonium.

Source: Neptune Papers No 4
Naval safety 1989:
The Year of the Accident
By: Joshua Handler, Amy Wickenheiser and William M Arkin

LETTER BOX

Letter from Goa

The National Meet of activists concerned about nuclear power gave a call for a strong movement against the Kaiga nuclear power station.

One of the significant issues raised at the meeting was that most of the nuclear power plants are situated near the borders of different states.

- Tarapur: Maharashtra—Gujarat
- Rawatbhata: Rajasthan—M.P.
- Kakrapar: Gujarat—Maharashtra
- Kaiga: Karnataka—Goa
- Koodankulam: Tamilnadu—Sri Lanka (Sea)

The damage caused in a nuclear emergency would seriously affect the neighbouring state.

For instance in the case of Kaiga, the Goa border is just 22 km away. According to Prof Shivaji Rao, environmental engineer of the Andhra University, in case of an accident at Kaiga, the entire population of Goa would have to be evacuated. It is therefore very important that the people of Goa take notice of this important aspect. The responsibility for evacuation will fall on the government in whose state the plant is located. Thus in the case of Kaiga, the Goa Government will conveniently absolve itself from all responsibility.

Essentially a watch must be kept against destructive development by the corporate world, which seeks to put people against people by getting their hard earned money locked into anti-people projects. Typical examples in Goa are Zuari Agro Chemicals and the Ramada Hotel, who in their attempt to get their environmental sins condoned, put in extra efforts to get the people of Goa to invest in their shares, debentures and fixed deposit schemes. Thus, when ultimately people protest against the environmental destruction and call for a closure of these projects, we will see our own brothers and sisters up in arms to protect these monstrous anti-people projects, since it is their money that is invested and they would need to protect their investments. Many of these people would otherwise be supporters of protest movement.

For those who are against nuclear power per se, it is important that they campaign amongst family and friends and the society at large, not to allow their money to be used for nuclear power financing. Next time you see promotional material calling for investment in the Nuclear Power Corporation through 9 percent tax-free bonds, remember Chernobyl and Kaiga and spread the message:

BOYCOTT NUCLEAR POWER BONDS!
STOP KAIGA NOW!

Roland Martins
Mapusa, Goa

NUCLEAR NOTES

Virtues of Insurance

After the Chernobyl accident international sea and transport insurance companies formed a "Nuclear Study Group" to investigate effects of serious nuclear accidents from an insurance perspective. According to Skandia - a Swedish multinational insurance company - "The results clearly showed that damages from a nuclear accident can be so extensive that the total capacity of the world's insurance companies is probably not enough to cover compensation." For this reason, insurance companies have added a new clause to sea and transport insurance policies that as of 1 January, 1991 excludes 'nuclear risks' from all insurance conditions.

The text from a policy dated 1 October, 1990 by Witherby & Co. Ltd. London reads:
Radioactive Contamination Exclusion Clause

1. This clause shall be paramount and shall override anything contained in this insurance inconsistent therewith to by or arising from
   1.1 ionising radiations from or contamination by radioactivity from any nuclear fuel or from any nuclear waste or from the combustion of nuclear fuel
   1.2 the radioactive, toxic, explosive, or other hazardous or contaminating properties of any nuclear installation, reactor or other nuclear assembly or nuclear component thereof.
   1.3 any weapon of war employing atomic or nuclear fission and/or fusion or other like reactionor radioactive force or matter.

From this text, it is not clear if the new clause includes accidents from transport of yellowcake and uranium hexafluoride, two of the most commonly transported radioactive materials. However, the Swedish Sea Insurance Association is more clear in its version, which states that there is no coverage for damages directly or indirectly caused by any radioactive product.

This does not however mean that the nuclear industry has been left without insurance. National governments and nuclear companies have taken on the insurance responsibility. The arrangements and the amounts of insurance vary from nation to nation.

Source: WISE News Communique 351

Vices of Gambling

A flask containing 40 irradiated elements of highly enriched uranium fuel which had been shipped from India was found to be contaminated with radioactivity when examined at Dounreay early in February. The contamination was discovered after the fuel had travelled nearly 10,000 km on an ordinary cargo ship, was driven by truck the length of Britain and lay at Dounreay for three days without any monitoring for radioactivity. The fuel was shipped from Bombay on the cargo ship Vishva Parijat on 24th of December, 1990 and passed through the gulf two days after the war began, although the authorities claimed that it had travelled through the area before the hostilities began. (See Anumukti's last issue)

Subscription Rates:

Rs. 25/- per year South Asia
U.S. $15/- per year airmail overseas
(Rs. 200/- per year if paid for in India)
Rs. 250/- for life (only within India)
Please add Rs. 6/- for cheques
Drafts should be drawn on:
State Bank of India Valod (0531)

Editor: Surendra Gadekar

Subscriptions, donations, manuscripts, inquiries regarding circulation, etc. should all be addressed to:

Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printry, Ahemedabad

Next Issue: August 15 1991

PRINTED MATTER BOOK POST

Copy Date: August 1,1991

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 5 Number 1 **August/September 1991**

Living Without Hope in Dungardih

It was hot and humid. Typical monsoon weather, but there had been no showers. After the long walk I was feeling very thirsty. In the distance was a farmer taking out young rice saplings for later transplantation. "Could I have a drink of water?" I asked. "You will have to go to my home," he answered. "Anyway, I am almost through here, come on, lets go."

We walked down the side of a large pond. Almost a lake. Lovely lush green scenery, There were some cattle grazing the grass growing on the banks of the pond at one end. "You can't drink the water of this pond. It is poisonous, gives you T.B. if you drink it. It is lucky that you have come here after the rains. During the summer the water dries up and the dust blows in the hot winds. It is terrible. One feels thirst all the time. Also it is very painful."

Just by the side of the pond is a small village. Some twenty, twenty five houses. I find that its name is Dungardih. I spy a well and advance towards it. "No! no. Don't drink water from there. That is also poisonous. The only water you can drink here is tap water supplied by the company (Uranium Corporation of India Ltd)."

"What about your animals? What water do they drink?" I enquire. "What can the poor creatures do? They drink the poisonous water from the pond."

Most of the men have gone to work. Work out here means employment with the company, either in the various mines or in the mill where the uranium ore is crushed and treated and converted to 'yellowcake'. Farming is not considered as 'work. Only the "unfit" and the unemployed do it.

Some children are playing in a field. I join them. They all look very weak to me. Thin almost emaciated hands and legs. Sanatan Mardi better known by his nickname Daman, studies in the second standard. He has been born with no fingers on either of his legs or hands. His mother calls me over to her hut. "I have lost five children. They were very weak. All died within a few days of birth. My only hope and support is Daman."

A twenty-five year old youth Mohan from a neighbouring hut tells me, "I am 'unfit'. I worked for just three months. My younger brother still works in the mill. It is the air. That is what makes us unfit. My father died three years ago after being declared unfit"

"How do you know that your younger brother won't get unfit?" I asked. "Our health is bound to become bad. But what are we to do? One has to eat. We know that it is more dangerous to work in uranium mines than in other mines. Look at Ghasia Majhi. He has this tumour in his neck. And there is my neighbour HodingMajhi. Sitting for the last five years at home after being declared unfit. His toes have had to be amputated. He still had fourteen years of service left. But why look at this village alone. Go to any village where there are uranium mines-Bhatin, Surdha, Narua, Rakha, Bhusabani-everywhere you will find the same thing. Skin diseases, Pain in the stomach, T.B., cancer, pain in the joints, terrible weakness and pain-that is our lot."

"What about a hospital? Where do you go for treatment?" "There is a hospital run by the company just near the mill (at Jaduguda). But there is no government hospital. This one is only meant for the employees. Some local people also go there. But it is very expensive. Most of us go to the government hospital at Tatanagar (40 km away)."

In the morning I had taken a lift in a truck to get to Bhatin mines. True to Narayanbhai's description in the song (see page 3-Editor) it was an open truck which drove right underneath a loading shed. Loading was done by automatic loaders. You press a button and a huge load of broken rock descends from the roof into the truck. It does this trice before a truck is full. Sometimes small lumps of the ore fall by the side. The driver or his 'cleaner' just pick them up and toss them over into the truck. Nobody wears any gloves or protective clothing. I ask a worker about this.

"The company does give uniforms but we can't wash them everyday. Some leave them in the changing rooms while others take them home. Masks are available but not for everybody."

Next to the Bhatin mines is a tailings pond. Waste water from the mines and the mill after uranium extraction is poured here. There is no "security." Not even a barbed wire fence. The tailings have become hardened, like stone. I meet another youth walking nearby. He shows me around. He says, "Many people come here. We talk to them. We tell them our sorrows. They take photographs. They go away. But there is no change in our condition. Is anyone working for that? Can you do anything to change our miserable lot?

On my way back to Tatanagar I kept thinking of his words. They reminded me of one of Narayanbhai's songs:

"There is a struggle going on today
between the forces of death and the
powers of life."

The terrible situation faced by the poor Adivasis of Jaduguda-a situation not of their making-is a problem of survival for them. But is this a problem that they have to face and solve alone? Is it not a problem of the entire human race?

"When will justice come to Athens ?"
They asked Thucydides.
And he answered,
"Justice will not come to Athens
until those who are not injured
are as indignant as those who are."

Suren Raut
Sampoorna Kranti Vidyalaya-
Vedchhi

From the Editor's

Before we can talk about the bomb we have to talk about where the bomb comes from. It comes from the land, from the people. Before they build a bomb they have already destroyed the Indian people. They have destroyed their water and their fishing before they have destroyed people with the bomb. We have got to get to where it is happening, right here in the back yard of our own country.

Brian "Banjo" Ratt

Recently I met Rajmohan Gandhi in Bombay. Glancing over a copy of *Anumukti* he exclaimed, "What! You have been bringing it out for such a longtime.

He probably meant that all that could have been said on the nuclear issue must have already been said and there was no point in stretching this harrangue any further. Needless to say that I don't agree with him, though I do feel that *Anumukti* ought to be in also Hindi and in other Indian languages for it to have any impact. All of us here at Vedchhi intend to make every effort to have a Hindi *Anumukti* out before the next year. The main bottleneck in achieving this is the absense of a computer at Vedchhi and if any of our readers has a computer to donate we would be most grateful.

I am in this wishes were horses mood because this is *Anumukti*'s 25th issue. We have decided to make it a special by focussing our attention on the root of the problem—the front end of the nuclear fuel cycle-the issue of uranium mining.

The mining issue is really three interlinked issues rolled into one.
The health problems of uranium miners and their families

- The contamination caused by the wastes generated during the milling process
- The disregard for the rights of the indigenous populations of uranium mining areas

Canada, U.S., Central Europe, France and French Africa, Namibia, Australia and South Africa are the major uranium producing areas of the world. India, fortunately does not have much uranium, though it has spent almost as much as the major producers in desperately exploring for ore.

Except for some high grade deposits found only in Canada, uranium ore usually contains only a few tenths of a percent uranium. All the rest of the rock is considered waste. Hence Uranium mines produce enormously huge quantities of waste known as 'tailings' Although the uranium extraction (milling) processes are able to remove almost 90% of the uranium they remove very little of the other radionuclides present. Thus tailings contain about 85% of the total radioactivity of the rock. The Jaduguda mines are specially bad since the quality of the ore being mined is probably the worst in the world. East German mines (where the uranium content was three times greater than that found at Jaduguda) were closed last year since they were hopelessly uneconomic. However, we not only continue to mine and mill at Jaduguda but are in the process of constructing another bigger mill nearby at Turamdih to process even worse quality ore. And the Uranium Corporation of India makes a profit. Such are the wonders of "self reliance" in the nuclear field.

Getting to know about the consequences of uranium mining from all over the world, only a single conclusion can be reached—the motto of the world-wide movement against uranium mining:

LEAVE URANIUM IN THE GROUND

The Price Jaduguda Has Paid

Go to the mines of Jaduguda
From where come the uranium loads
See how it is carried in open trucks,
and falls in middle of roads.
Go to the reactors of RAPP
How radiation has spread!
Look at the workers of Tarapur
How they have been mislead.
Very Frightening, very frightening, very frightening indeed
Is the Maya of atomic energy

Narayan Desai

There was a time when Jaduguda used to be a place of scenic beauty. Dense green forests, low mountains, small villages surrounded by hills, hardworking people, playful and eversmiling children, open air, flowing streams; everything was once here!

But they had one more thing-uranium in the womb of mother Earth. Exploring man got to know of this. And then atomic man had to grab it at all costs. The bowels of the Earth were torn open and digging and ever more digging was done to get the uranium out. The hunger of nuclear reactors for uranium was satisfied but the people of neighbouring 1200 villages have become both hungry and naked.

People whose sustenance was the forest, became dispossessed. Jungles got destroyed, the hills became barren and the people became powerless.

Prohibited Area

Fact about the uranium being in the ground was known in 1950s itself. But it was in 1967 that uranium mining and processing equipment came to the area. Along with the equipment, operating workers came, mining scientists came, officials came-all of them came from outside. Buildings were built, houses were built for them to stay. Those who had come without houses now had homes, but those who had ho,e and lived here for long, became homeless. Some went into distant hills, some to Naroana, some wandered around—they are wandering still.

This green self contained Adivasi (aboriginal) village in the Singbhum district of Bihar became part of the mainstream of development. Automobiles and vehicles started plying to and fro from Rakha Mines station to Jaduguda. The environment became smoke filled; clean Gura river became dirty-1200 villages were consumed and Jaduguda became an industrial township. Today this place provides the uranium for all the Indian reactors with the exception of Tarapur.

Those villages and people who refused to be displaced in the beginning are now slowly being squeezed out. Radioactive pollution is increasing rapidly. However, as yet, even after 24 years, there is no instrument to measure this pollution.

Waste water has spread far and wide. A population of nearly 5,500 people is suffering this water pollution. Chati Kocha, Rani Kocha, Dungardih, Lakhi, Talaitand and other villages are dependent on the waters of a lake which carries a signboard in English — **"Prohibited Area."** The villagers do not understand English but they do understand and know that when they breathe, drink and eat, the air they breathe, the water they drink and the food they eat are all poisonous.

An Epidemic of Deformities

The village in the immediate vicinity of the tailing pond is Chati Kocha. A little farther is Rani Kocha. The total population of both these villages combined is around 500 of whom 100 are children. A survey found that two children are not able to see at all, six are able to see dimly, four are hearing impaired while eight are mentally retarded. Half the women complained of white discharge while 47% complained of early and frequent menses. In the last five years, eight women have given birth to deformed children who have died within a week of birth. In these five years there have been more than 30 spontaneous abortions. And all the women complain of fatigue, weakness and depression.

Half the men too complain of tiredness and depression. The amount of lymphocytes in the blood of 54 per cent of the people are quite high indicating a disposition towards cancer.

The condition of the children and the plant workers is terrible. Seven year old Manoj has both his legs turned outwards below the knees. He cannot walk properly. Eight year old Mani's left hand comes only till the elbow. Eight year old Shiv is a patient of thalesimia and requires frequent blood transfusions. Nine year old Tulsi also suffers from the same disease. Munna, who is twelve years old suffers from megacolon. He can neither speak, nor walk nor do anything with his hands.

Elders of the area say that earlier it wasn't like this. Those families which have had deformed babies had not seen a case of deformity for at least five generations. Thus, the general public opinion in the area feels that all these illnesses and deformities are due to uranium mining and processing.

Official Claims

Uranium Corporation of India Ltd (UCIL) says that radioactivity is spreading very slowly and is well within internationally accepted "safe limits." According to officials, the amount of uranium found in the ore here is only 0.04 to 0.06 percent.

The waste remaining after uranium processing is taking from the mill through a long pipe to the tailing pond. This pond covers an area of 3.6 square kilometers. The pipe is broken in a number of places and the water keeps leaking. Adivasi women from surrounding villages use this water for all domestic purposes from drinking to bathing and cooking.

The administration officials claim that once uranium is extracted from the uranite, the remaining portion of the ores are not radioactive. The wastes contain only 0.005 milligrams per litre of uranium. Water after use is thrown into the Gura river which goes and meets Subarnarekha and tias the pollution from Jaduguda spreads all over Singbhum.

At the time of UCIL planning the planners had given a clear warning that the wastes should not be exposed untended and neither should they be released to the rivers. Till now the UCIL administration has been lying that the radioactivity posed no risk at all but now plans are afoot to set up an effluent treatment plant at the cost of Rupees One crore. This is being done after an investigation by central authorities and the International Committee for Radiological Protection. It is due to this pressure that attempts are now being made to separate the effluent waters from reaching the Subarnarekha.

The Next Sacrificial Spot

A major deposit of uranium has been found at Domiasiat, 140 km south-west of Shillong in North-East India. It is claimed that the deposit is "the largest, richest, near-surface and low cost sandstone type uranium deposit discovered in India so far."

The ores are spread over a 10 square kilometer area at depths varying from 8 to 47 meters from the surface. Six layers of varying dimensions with grades up to 0.41 per cent uranium oxide have been delineated by drilling.

Indian Express 13 August 1991

A Dump for Outside Waste

Radioactive waste from the Nuclear Fuel Complex at Hyderabad and the Variable Energy Cyclotron Centre at Calcutta is also dumped here in the pond. Earlier this waste used to be kept in Hyderabad, but in 1982 four workers died while working in midst of this waste. At the time there were strong protest from neighbouring residents against waste storage in the vicinity. It is only after that that this waste has started coming to this Adivasi area bearing its deathly sting.

While the UCIL management doesn't accept the fact that radioactivity has in any way been harmful to either people, animals, trees or plants, the high officials have made arrangements for their own food to come from a government farm some 44 kilometers away.

Ms Manimala
Dharmayug 4 March, 1990.
(Translated from Hindi)

A Primer on Uranium Mining

•Why leave uranium in the ground?

No matter how uranium is mined, there will be radioactive contamination of the environment. Uranium deposits exist today because of their isolation from air and water over geological time scales. In its natural state, uranium, other radioactive materials, and heavy metals are in the form of solid rocks and therfore only tiny amounts if any can escape to the surrounding environment.

•Why are the products of uranium mining dangerous?

Uranium being radioactive keeps costantly changing into other substances, (uranium daughters) most of which are also radioactive. Thus, uranium contributes a very small percentage to the total radioactivity of the ore. After milling though most of the uranium is separated , more than 85% of the radioactivity of the ore lands up in the tailings. Since some of these daughters are especially long-lived, the tailings constitute a radiological hazard essentially for ever.

•What are the most dangerous uranium 'daughters'?

Radium-226 and Radon-222 are especially dangerous. Radium because it accumulates in the bone and is harmful to life-forms at very low concentrations. (See *Anumukti* Vol.4 No.5 April/May 1991). Radon, is most dangerous because, being a gas it is the only uranium decay product that can be breathed into the body. It also emits the most dangerous form of radioactivity-a radiation-which causes greater damage to lung tissue than other forms of radioactivity. Thirdly, radon decays rather rapidly and radon daughters decay faster still. Thus radon in the lungs just means a rapid burst of radioactive showers on the surrounding tissues. Accumulation of radon in underground tunnels is the reason why more uranium miners die of lung cancer than other miners.

•What happens at the uranium mill?

The rock is crushed and ground to a fine sand and mixed with large amounts of water and chemicals. The chemicals are either acids or bases, depending upon the pH of the ore. In India, acidic leaching is done using sulphuric acid. The solution is filtered, concentrated, purified and uranium is precipitated in the form of magnesium diuranate commonly known as Tellow Cake'. Two types of wastes (rejects in nukespeak) are generated, solid wastes or tailings and liquid wastes. Uranium tailing pose the greatest long-term threat, while leaks, spills and groundwater pollution by liquid wastes constitute the major short to medium term impact.

•Is radioactive pollution the only hazard of uranium mining?

No, tailings contain heavy metals such as lead, zinc, manganese, cadmium, and arsenic whose rates of release to the environment must also be controlled. These elements do not decrease in toxicity with time since there is no decay process. They simply last forever. Heavy metals poisoning is usually noticeable long before any effects of radioactivity. Huge quantities of process chemicals are used in the milling process and then dumped into the environment.

•Are there different ways of mining uranium and which one is better?

Uranium is mined in three ways and each method has its own unique set of environmental problems:

- Open-Cut Mining
  This is resorted in places where there is high grade ore fairly close to the surface as in Canada, Australia, U.S., South Africa. The whole area is bulldozed, and roads, plant and dams to hold the tailings arc built. Environmental problems result from the great amount of surface contamination caused. (See the stories on Canadian and Australian mines)

- Underground Mining
  When ore is situated deep underground, then usually shafts are drilled and the mining is done underground as at Jaduguda. There have been a large number of reports from U.S. and Europe of mines being plagued by ventilation problems in the past, leading to excessive exposure of workers to radon gas. (Sec the stories on Jaduguda and on Red Rock in U.S.)

- 'In-situ Leaching'
  An acidic solution is forced through the ore-body itself to dissolve the uranium. This has been done in a number of places in U.S.A. and in what was formerly East Germany. The environmental problems here arc obvious, with the ever present possibility that the solution of sulphuric acid, oxidizing agent, uranium and other toxic heavy metals would end up in somebody's drinking water. (Sec the report on the restoration problems in East German mines.)

•Can anything be done to mitigate the effects of uranium mining and reduce the contamination?

First and foremost, stop producing any more waste. Other steps include having physical barriers so that people, animals and birds do not come in contact with contaminated areas. Provide alternatives so that people and their animals are not forced to drink contaminated water or grow food on contaminated land.

Sources: Miles Goldstick's book "Voices from Wollaston Lake" (See Review in this issue, page 10) and John Hallam's article on uranium mining in Australia.

Bury My Lungs at Red Rock

Red Rock was one of the first spots where the U.S.Atomic Energy commission and the post war uranium companies began prospecting for the radioactive fuel. Like m?ny of the other problems stemming from industrial and mineral development on the indigenous reservation, the misfortune of the people of Red Rock had its origins in the community's poverty and the lack of education. The Government and the energy companies were willing to take advantage of that underdevelopment.

In New Mexico, the nuclear story began with the 1945 Trinity Test, which confirmed that an atomic bomb could be successfully exploded. Three years later, the newly formed AEC began authorizing purchases of uranium to stockpile for its nuclear weapons arsenal. It started providing incentives to mining companies to find high-grade uranium deposits. It was during this period that Kerr McGee opened several shallow mines near Red Rock and set up a mill to process the uranium ore in nearby Shiprock, New Mexico.

When the mines uranium supply was exhausted in 1968, (the same year that Jaduguda mines started operation - Editor), they were abandoned, leaving contaminated build-up and more than seventy acres of uranium wastes. Also left behind were several hundred Navajo miners who had been exposed to deadly doses of radioactive gases and particulates.

Then, as now, the reservation offered a profitable opportunity to companies like Kerr McGee. On the reservation there were no taxes, little regulation and cheap labour. 'The company came around and said there were mining jobs opening up, but they didn't tell us **a** thing about the dangers of uranium mining," former miner Terry Light recalls.

John H Lee, who lives with his wife in a one-room unplastered home near the Red Rock area, worked as a miner for more than twenty years. He complains of spitting blood and stabs of pain through his lungs — the signs of a developing lung cancer. "I now feel sick all during the day so I just sit back in the chair and rest," Lee says, noting that he had seen most of his co-workers die. He has no doubt that his illness comes from his mining work.

"It made us sick to go into those mines,"Lee remembers. 'The white men sat outside the mines and pushed us Navajos into those dusty mines right after dynamiting."

'They chased us in there like we were slaves." recalls another miner. "I remember that it used to be so dusty that we were always spitting up black stuff and how when we went home we all had headaches from breathing all that contamination.

The major killer in uranium mines is the radioactive inert gas, radon that escapes from the uranium ore. The dangers of radon had been known for at least fifty years before the mines were opened, but the AEC refused to admit that there was any danger at all present in uranium mining for over twenty years of nuclear energy development.

'Those mines had more than hundred times the radioactivity allowed today." says La Verne Husen, director of Public Health Service in Shiprock. "They weren't really mines, just holes and tunnels dug outside into the cliffs. Inside the mines were like radiation chambers, giving off unregulated and unmeasured amounts of radon. The problem was that back in the 1950s nobody was riding herd on the companies. It was a get-rich-quick scheme that took advantage of Navajo miners who didn't know what radioactivity was or anything about its hazards.

Husen says that the two main problems caused by uranium mining were lung cancer and pulmonary Fibrosis, where silica dust particles become embedded in lung tissue, eventually making it difficult to breathe.

> *"In the last twenty years, lung cancer rates amongst Navahos have increased by eighty-five times.*

"The lung cancer comes from breathing radon gas," Husen adds. "It stays in the lungs and continues emitting radiation — sort of like walking

The Death of Rio Puerco

> Navahos need safe drinking water. Instead, what they have got for last twelve years, are "studies"

Church Rock, New Mexico, would seem an improbable spot for a nuclear disaster. A dusty cluster of industrial machinery set in the arid mesas of the great Southwest U.S., its most distinguishing feature might be considered a large pond of murky liquid, unusual in such dry terrain. Church Rock also hosts a series of underground uranium mine shafts, a mill and a scattered community of Navajo families. A deep gully leads from the mine site into the Rio Puerco, which once flowed only when fed by spring rains. Now, it is wet year round, bolstered by water pumped from mine shafts to keep them from flooding. The 350 families who water livestock in the Rio Puerco rely on their small herds to eke out a meager existence. During the hot days of desert summer local children would play in the stream as their parents tended the goats,sheep and cattle.

In the early morning hours of July 16, 1979—just fourteen weeks after the accident at Three Mile Island-all of that changed. The then brand-new Church Rock tailings dam burst, releasing a million gallons of acidic tailings and 1200 tons of solid tailings into the Rio Puerco river. The spill extended 40 miles downstream through the Navajo territory into the neighbouring state of Arizona. No one was killed in the actual flood. But along the way it left residues of radioactive uranium, thorium, radium, and polonium as well as traces of metals such as cadmium, aluminum, magnesium, manganese, molybdenum, nickel, selenium, sodium, vanadium, zinc, iron, lead and high concentrations of sulphates. The water of the Rio Puerco and of the wells near it was rendered unfit for consumption. It remains so still. Livestock from the area cannot be marketed.

Except for the bomb tests, Church Rock was probably the biggest single release of radioactive poisons on American soil. Ironically it occurred thirty four years to the day after the first atomic test explosion at Trinity, New Mexico, not far away.

However, the spill was not an isolated incident of environmental abuse of Rio Puerco. For 18 years from 1968 to 1986 United Nuclear Corporation and Kerr-McGee mines continued to discharge uranium mine water into the river at the rate of 5,000 gallons per minute.

River contamination is still being "studied". According to a report issued by Robert Webb, a hydrologist for the U.S.Geological Survey, surface water of the Rio Puerco has sometimes between 10 to 100 times the maximum allowed level of radioactivity.

Sources: Killing Our Own and WISE News Communique.

around with an atom bomb in your lungs."

Lung cancer was formerly a rare disease amongst Navajos. In a seven year study completed in 1972, no cases of lung cancer were found in a review of 50,000 chest x-rays of Navajos. But the rates of lung cancers amongst Navajos have soared because of exposure to radiation. Dr Gerald Buker reported in a monograph entitled "Uranium Mining and Lung Cancer Amongst Navajo Indians.' that the risk of lung cancer had increased by a factor of at least eighty five among Navajo uranium miners.

"It is pretty hard here.' comments Ray Joe, a former uranium miner in the Red Rock area. It's like we have been having a war or something like that here — with so many of our men dead and dying or sick."

There are ten million tons of radioactive mess left on the Navajo reservation alone by Kerr McGee and other companies. The Department of Energy has estimated that it would cost $20 million (1978) to clean up these tailing piles, which due to their proximity to community settlements, pose a serious risk to the health of the Navajos. For the last ten years since 1968, wind and water erosion have spread radioactivity far outside the original perimeter of the uranium mills.

A two-year preliminary study amongst the Navajo found an unusually high number of birth defects, including hydrocephaly, microcephaly, downs syndrome, cleft lip, cleft palate and epilepsy among more than 500 babies born between 1967 and 1976. Earlier surveys had found a serious increase in bone, ovarian and testicular cancers among children living in the area of former uranium activity.

Like countless other tragedies in the history of Native Americans, this one remains lost in the dust of the vast, dry stretches of the reservations.

Postscript 1990

In 1979 U.S.Congress passed the Uranium Mill Tailings Radiation Control Act (UMTRCA). The purpose of the Act was to set up U.S. standards for the clean-up of uranium mill tailings, implementing:

- an impervious layer under the pile to prevent seepage to groundwater
- a protective cover of several layers to prevent erosion, seepage of rainwater into the pile and emanation of radon to the atmosphere
- provision of long-term environmental monitoring and maintenance funds

However, during the eleven years since the passage of the Act only 26 million tons out of the 175 million tons originating from the uranium milled for nuclear weapons have been reclaimed. Only three out of the more than twenty piles were moved to safer locations during reclamation. Thus, even most of the 'reclaimed' piles still present a long-term hazard to environment and health since they could not be lined with an impervious layer to prevent seepage to groundwater. For this reclamation to be carried out the U.S.Government has already spent over $2 billion.

The major portion of the tailings originate from uranium mined for power generation purposes and has to be reclaimed by the uranium industry. This industry has repeatedly tried to weaken standards and to pass the cost of the clean-up on to others, so far unsuccessfully. But it has managed to delay the clean-up of these enormous piles.

Sources: Tom Barry's article "Bury my lungs at Red Rock" in "First There Was The Bomb ...and WISE News Communique 326/327, 9th Feb. 1990

Joyless in Japan

High incidence of deaths from lung cancer have been observed among miners and local residents living near former uranium mines in Tottori Prefecture, Japan. The mines were operated by the Power Reactor and Nuclear Fuel Development Corporation (DONEN) in the late 50s and early 60s. During 1957-61, about 150 miners worked in the mine. Kyodo News Service sources say that more than ten miners and residents in the vicinity have died of cancer. Of these seven had lung cancer.

DONEN claimed that there was no relationship between the uranium mines and lung cancer. Many residents, however, spoke not only about the high rate of cancer in the area, but charged that the corporation did not warn about the dangers of radiation before the miners began working. Nor did the corporation require the miners to wear protective masks. DONEN countered that it did provide the masks, but a promotional pamphlet issued by the company contains photographs of T-shirt clad miners working in the mine without wearing masks. *(Most Uranium Corporation of India Ltd promotional brochures contain similar pictures - Editor.)*

Japan Times reporting on the incident, noted that high occurrences of lung cancer of uranium miners had also been reported from U.S. According to a U.S. public health report, of the nearly 6,000 miners who worked during the 1940s to 1960s, 10 to 20 per cent had died or will die of lung cancer. Many groups would put these percentages even higher. According to Big Mountain Legal Office in the U.S., of the 150 miners working at Kerr-McGee mines, 38 were dead of lung cancer and another 95 had cancer and lung diseases by 1980. Other health problems include a high rate of extremely rare birth defects such as Kneist Syndrome.

Abuse of Aboriginal Rights

Three companies now control over half the entire world's uranium production, and more than two-thirds all uranium reserves. Two of these are government-controlled (France's COGEMA and the joint Federal Canadian /Saskatchewan provincial government's CAMECO). The third is the mainly British owned giant RTZ (formerly Rio Tinto Zinc), which is the world's most powerful mining company.

RTZ is the world's leading copper producer, its third most important gold producer, a crucial supplier of the strategic metal, titanium (used in aircraft industry), and on the top of the heap of western uranium producers.

Conzinc Rio Tinto (CRT) is the Australian subsidiary of RTZ. Its exploration lease in the Rudall River National Park in Western Australia has been described as potentially a three-act nightmare: a uranium mine, inside a national park, on Aboriginal land.

The 1.5 million hectare Rudall River National Park is the largest in Western Australia. The Aboriginal Martujarra tribe who are the traditional owners of the land, call it Karalamilyi. It provides one of the best examples of an undisturbed desert ecosystem in Australia and perhaps the world.

The nearest Aboriginal communities at Punmu and Pangurr are not legally recognised as landowners but have attempted since 1981 to establish viable settlements in the region. The story of last two hundred years has been one in which many Aboriginal people have lost access to their land and traditions, and have had their cultural and religious beliefs trampled upon.

This isn't the first time that CRA has mined uranium on Aboriginal land. CRA operated the Rum Jungle mine in the Northern Territory between 1953 and 1971, initially to supply Britain with uranium for its weapons testing programme. In that time a tailings dam collapsed polluting the Finniss River with radioactive waste and heavy metals. It has been biologically dead for years now.

In 1962, CRA's subsidiary, Comalco, bulldozed Aboriginal houses and a church to end opposition to bauxite mining on Cape York. In 1980, CRA flew three of the 35 traditional owners of the Warmun community to Perth and inveigled them to sign their land over to diamond mining. Leaked documents from that time foretell the kind of treatment Aborigines around Karalamilyi may receive... 'If CRA... can resist moves to meet Aboriginal compensation claims ...its savings will be substantially greater than the proposed expenditure on the company's public relations programme next year."

" But I have promises to keep ...

The Promise
The environmental impact statement for the Roxby Downs uranium-gold-copper mine in South Australia predicted in 1982 that once the mine reached full production there'd be 10,000 jobs, $18-28 million in royalties paid to the state, and a boost in state exports by 32 to 43 percent. In 1989 the mine reached its full production capacity.
The Reality
800 jobs, $3 million in royalties paid to the state and exports of 4 percent. The $3 million falls well short of the interest the government has to pay on the $ 50 million it borrowed to build schools, roads and other community facilities for the mining associated town of Olympic Dam.

Rudall River is known for its strong dust storms around the beginning of the cyclone season. The Western Desert Land Council says local Aborigines are aware of radiation sickness and are worried that increased mineral exploration will destroy plants and animals in the park.

Uranium was discovered in the western part of the park by CRA in late 1985. Australia has a "three mines" policy which does not allow a new mine to start operations. Ostensibly only involved in exploration activities, CRA has in reality established a small-scale mining operation in the mountainous catchment basin of the Rudall River. A conservationist who flew over the site in mid-1986, confirmed the existence of a permanent camp with 40-60 personnel and 4 drilling rigs operating inside the park. Convinced that other uranium deposits are to found in the region, CRA has taken out exploration licenses on virtually the entire southern half of the park.

Strong pressure from Aboriginal people and the anti-uranium mining activists resulted in a statement in July last year from the Prime Minister saying that the Rudall River project would not go ahead. However, the clout of the mining giants became soon apparent when in April this year the same government brought forth new legislation which would allow the mining to go through. Although there is wide public support for a complete ban on mining in national parks the new legislation bans mining in only 57 out of 60 sites. It allows for continued access to areas considered to be of particular economic importance and would 'compensate' the park for the land lost to mining by addition of equivalent areas from elsewhere. Needless to add that while bringing forth this piece of legislation the Western Australia's Labour Government did not consult the people most affected by this decision nor did it consider the rights, welfare and the interests of the Martujarra people.

Sources:
The Third Opinion &WISE News Communique: 351,336,325,307,282

Undoing is Not Easy

Uranium Mining in German Democratic Republic

Uranium mining began in East Germany in 1946. The uranium was used for Soviet weapons production. The mining operation was carried out under the auspices of a joint Soviet-East German company SDAG 'Wismut'. By the time mining operation ceased in 1990 with German unification, GDR was the third largest uranium producer in the world after Canada and U.S.

The main reason for the closure of the mines was the fact that with the collapse of uranium prices during the 1980s, mining had long become terribly uneconomical, since the ore left was generally of poor quality (0.1%-0.09%) For comparison's sake, Canadian ore is ten to six hundred times richer in uranium. (The ore now being mined at Jaduguda and from which Uranium Corporation of India Ltd claims "profits" year after year, is just 0.03%—0.04%. Wonders never cease! - Editor)

The main mining area is in the south of the country in the Gera-Ronneburg region. This region is known as the "uranium province", and is now in deep economic recession with the closure of the mines. Wismut used to employ over 40,000 people till late last year.

The whole area has become an ecological disaster zone. Ore with too little uranium for extraction, along with wastes from the mines and mills is stored in enormous piles of tailings, covering an area of several square kilometers. Rain water washes the tailings away, endangering the ground water. Radon gas from inside the mines is simply pumped up to the ground and the pipes bringing the radon can be found in the middle of farm land still in use.

Data available on radiation levels in the whole area is still very poor. In some homes in the city of Schneeburg, radon levels above 30,000 Bequerrels/cubic meter have been recorded. ("Acceptable" levels are just 250 Bq/cubic meter. In the U.S., the acceptable limit for radon in homes is just 150 Bq/cubic meter.) The levels found in homes in Schneeburg are considered unacceptable even for uranium miners. They have probably been caused by former silver mining activities in the Erzebirge mountains.

> *Radon levels found in homes in Schneeburg are considered unacceptable even for uranium miners.*

A study conduct ed by an East Berlin doctors' collective and sponsored by the Lutheran church, found that rates for leukaemia and other cancers are significantly above average in this region. The study also found above average incidence of hair loss among both miners and other inhabitants, cases of impotence and testes cancer among miners and miscarriages and birth defects in miners' families.

The Schmirechau mine is the largest in the Gera-Ronneburg area. Four thousand seven hundred workers used to work there. Originally it had an open-pit mine with a depth of 240 meters; this has been partially refilled and mining was then continued up to 500 meters underground.

The uranium was milled at Seelingstadt uranium mill. Its annual capacity was approximately 3 million tonnes of ore.Its tailings pile is one of the largest tailings pile in the world and contains a total of 86 million metric tonnes of solid mill tailing and 51 million cubic meters of liquids in two ponds covering an area of 2.5 square kilometers.

The mill formerly used an acid leach process, but since 1990 it has used an alkaline leach process to achieve some neutralization in the tailings pond. The tailings contain an average of 11 Bq/gram of Radium-226 and a total of two million tons of pyrite. Radium-226 decays to produce radon. It also presents a health hazard on its own by seepage into ground water and rivers. Pyrite when mixed with air and water creates sulphuric acid and is thus lethal to plants downstream. It also helps in the migration of heavy toxic metals. The pyrite problem can persist for hundreds of years.

Now, a major effort is being made to reclaim and stabilize all the piles to reduce the health hazards. Under this plan for Schmirchau, 43.2 million cubic meters of material from different waste rock and low grade ore piles will be dumped into the former open pit mine there. After the end of all reclamation work, ground water will no longer be pumped out. Water will fill the whole underground tunnel system as well as the open pit being backfilled. Thus all materials now being dumped into the pit are expected to be in contact with groundwater for an indefinite period of time.

Western ecologists have criticised the plan. For one thing it is being executed without observing the legal procedure necessary under the new unified German law. The most serious cause for worry is however the persistent rumours that hazardous materials might have been dumped into the pit in earlier years under the previous government. However now it is probably impossible to remove parts of the backfill to confirm these suspicions.

The costs estimated by Wismut for the clean-up are DM 5 billion. However, this has been disputed by a study conducted by Oko Institute in FRG and the Southwest Research and Information Center in New Mexico who believe that the costs shall rise to DM 15 billion. Needless to say that neither the GDR government nor the Soviet Union had made any provisions for dealing with these costs.

Sources: WISE News Communique Nos. 346,341,340,334,324/323,299

REVIEW

Voices From Wollaston Lake

Resistance Against Uranium Mining and Genocide in Northern Saskatchewan

Miles Goldstick

Earth Embassy and WISE 1987

Saskatchewan province in the west of Canada is the "Saudi Arabia of the uranium mining industry". The extra-ordinarily rich deposits—usually 100 to 1000 times richer in uranium than those being exploited in India—found there have made Canada the largest producer of uranium in the world. The same callous disregard for the environment and for the rights of the local population (usually indigenous people) that characterize uranium mining in the rest of the world including India, hold in equal if not greater measure in Saskatchewan too. Yet I have not separately included a 'story' about uranium mining there in this issue of *Anumukti*. The reason I have not is because this book "Voices From Wollaston Lake" says it all in an eloquent and moving manner. The book is available with the author and he would gladly send it to activists for just the shipping costs.

WISE Uranium Special

WISE plans to publish a special edition on uranium shortly. The purpose is to provide support for local resistance to uranium mining. Protest and support groups are urged to send their contributions (particularly information on their needs and local campaign updates) to

Miles Goldstick
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91 Osthammar, Sweden

The book can be divided into three parts. One part tries to present the contrast between two diametrically opposed world-views - that of the local indigenous people who are trying to live in harmony with their surroundings verses the dominance and the destruction of the land caused by the uranium mines. Another part of the book presents information on uranium mining, the 'uses'(abuses) of uranium, effects of mining on the environment and on people's health, while the last part of the book is the story of the struggle waged by the Chipewyan and people against the destruction of their land from 1972 to 1985 and especially the story of the unprecedented blockade of mining operations in June 1985. This action was the first coordinated nonviolent action against uranium industry in Canada.

Today it often seems as if Gandhi is no longer relevant to 'modern' India, what with "freeing the shackles on Indian industry" and the dire necessity of IMF loans for development. Echoing from the other side of the world, one of the voices which beckon from Wollaston Lake is the voice of Gandhi. It makes the book doubly relevant in India.

German Pollution Fears

The Koenigstein mine near Dresden started operation as a conventional underground uranium mine in the 1960s. Underground leach tests were first performed in 1969. In 1984, conventional mining was completely replaced by underground leach technology.

In-situ leach mining is a process where a liquid leaching agent is pressed through a deposit and the liquid caught on the other side. Uranium and other minerals are then removed from the liquid in a recovery plant. The purified liquid may then be reinjected into the deposit.

The process is only successful under rather special geological conditions. The uranium must be located in a layer of permeable sandstone confined between impermeable layers. At Koenigstein, uranium was mined from an aquifer at a depth of 150-280 meters below the surface. Unfortunately, mining activity has connected this aquifer with the one above it which is used to supply drinking water to a densely populated area. Separating the aquifers is one very difficult part of the restoration programme.

800,000 cubic meters of leach liquid circulated between the ore zone and the recovery plant. Over 1,000,000 cubic meters of the liquid are still present in the ore. As the ore zone aquifer is not impervious, there was inflow of water into the leach liquid circuit. Therefore waste water had to be treated before being released into the Elbe river. This treatment produced enormous amounts of sludge that was dried and stored on waste piles. Besides this, water flowing into the underground tunnel system had to be pumped out of the mine and treated before being released into the Elbe. The total amount of treated water released in 1989 was 5.3 million cubic meters. Also released with this water was 1.7 billion Bequerrels of radium-226 which was dissolved in the water.

The mine reclamation plan hopes to neutralize the leaching liquid in the ore zone by injection of limewash for at least the next ten years and by then allowing the mine to flood. However, there has not been extensive research on this subject to prove whether this would work in the long term. Attempts will also be made to prevent unequal settling of the rock layers by blasting the remaining pillars in the mine but the effectiveness of this step is also questionable.

The Peril in Peringome

Nuclear Power Corporation has finally selected the site for the proposed nuclear power station in Kerala. Successive State Governments—both the present United Democratic Front (UDF) as well as the previous Marxist led Left Democratic Front (LDF)—have been giving full cooperation in this proposal regardless of the wishes of the people.

Peringome is situated just 12 km from the thickly populated municipal town of Payyanur. The place will be shortly taken over by Nuclear Power Corporation according to a statement made recently by Department of Atomic Energy chief, Dr.P.K.Iyengar at Thiruvandapuram.

In the early eighties, even before the great tragedy at Chernobyl, the Government of Kerala had to retreat from an infamous attempt to construct a nuclear power plant at Bhoothathanakettu in Ernakulam district. There had been stiff opposition to the move from the people, and just before the 1984 elections the ruling party had made a public statement to the effect that the move was being abandoned in view of the strong public opposition.

Awareness about the ecological, socio-political and other aspects of the nuclear issue has been gaining momentum in many parts of Kerala, thanks to the ceaseless efforts of environmental groups, antinuclear activists and intellectuals. People's protest has grown along with awareness.

Strangely enough, the nuclear establishment seems to be in no mood to give up its pursuit to extend their empire even to the most densely populated state of Kerala. It appears as though the nuclear monster needs to be settled at one place or another within Kerala. During last one year, members of the Nuclear Power Corporation's Site Selection Committee visited many places throughout the state. Despite the secrecy surrounding these visits, the nucleocrats were greeted with loud protests by the people of the respective places viz.Peringome (Kannur district), Bela (Kasargod district) and Kothamangalm (Ernakulam district). The nuclear lobby was provided every help and facility by the then Chief Minister, Electricity Minister and other concerned officials inspite of the fact that the government kept insisting that no power station would be built against the wishes of the people.

Against this background, hundreds

OATH

In the name of the thousands who died in Hiroshima, and
those who are still dying, we pledge:
We will be constantly vigilant against nuclear power.
Three Mile Island, Windscale, Kyshtim, Chernobyl —
In the name of the victims of these disasters
which turned acres of fertile land into a vast expanse of dead desert,
We won't allow the use of nuclear power
We are obliged not to pollute our air, water and the Earth,
while bequeathing them to our children, humanity,
We shall not be unfaithful to this obligation
We uphold our belief in the innate goodness of humanikind
We cannot allow any one to let loose the mysterious and
uncontrolled evils of nuclear power.
What they told us — that nuclear energy is for electricity
We now realize to be a big lie.
We are against bombs and wars,
And the silent wars of reactors
We won't throw our children in a sea of radiation.
Forgetting all our petty differences,
And joining hands we vow
To fight against this nuclear monster
And defeat it at all costs.
On this the Forty sixth anniversary of Hiroshima
This is our solemn oath

of public meetings and discussions were initiated by several environmental groups throughout Kerala. As a result antinuclear forums and groups have sprung up in several towns and villages of the state. Chernobyl Day is being observed in various places and in 1990 a state-level convention was held in Thrissur. Conventions and rallies have been organised in a sequence at Kozhikode, Kottakal. Pavvanur, Triarpur, Peringome and Bela in which prominent antinuclear activists from outside the state also participated.

Meanwhile, the previous L.D.F. government sacked an eminent scientist, Prof. R.V.G.Menon from the directorship of Agency for Non-conventional Energy and Rural Technology. (See *Anumukti* Vol.4 No.l-Editor.) The action was obviously a measure of vengeance for his publishing an article about the hazards of nuclear technology. The fact that the government action against one of the most popular exponents of the people's science movement coincided with the intensification of the propaganda regarding the indispensibility on nuclear energy, clearly exposed the anti-people nature of the developmental policies followed by the government and the uncritical acceptance of this developmental model by the L.D.F.

Nucleocrats in India have been arrogantly marching forward with their killing technology totally disregarding the immense amount of new information that has been pouring in about the hazards involved in mining, processing, transportation, and use of uranium. They are still trying to sell the big lie that nuclear power plants are meant for generating electricity. The proposed plant at Peringome will incur an expenditure of Rs. 2,500 crores and will produce electricity for mere 25 years. Considering the fact that the construction of the plant would take several years and during operation it will shut down frequently due to 'leaks', during which time it would consume enormous amounts of electricity supplied from outside, the claim that the plant will solve the chronic problems of Voltage crisis' of Northern Kerala, ring hollow.

People of Kerala are now engaged in a bitter struggle to oust the nuclear monster. Hiroshima Day, 6th of August 1991 was observed as Peringome Protest Day. All the Sate Government and Central Government offices were brought to a standstill in and around Peringome. Around three thousand people, with hundreds of women with babies in their arms courted arrest while picketing government offices at various points. At the end of the token strike, people from all walks of life took the oath to fight the nuclear monster with all their strength. (See box on previos page.)

There were solidarity rallies and fasts organised throughout the state, in which prominent intellectuals, writers, scientists and religious heads actively participated.

We request environmental groups, antinuclear activists and all peace loving and democratically minded people throughout the country to express their solidarity with the people's struggle at Peringome.

Dr Surendranath
Antinuclear Forum
Peringome, Payyanur, 670332
Kerala

Workshop on Nuclear Power at Ruia College, Bombay

The workshop was part of a series of workshops being conducted every fortnight in different locations in Bombay and was held on Saturday, the 3rd of August, 1991, from 10.15 in the morning till 5.00 in the evening. About 100 students and staff members attended the workshop. The workshop was conducted by Shri R Ashok Kumar of the Bombay Sarvodaya Mandal and Ms Aradhana of the Sampoorna Kranti Vidyalaya, Vedchhi and was held under the auspices of Science Association of Ruia College.

The main points raised during the workshop were:

- The health consequences of continued widespread use of nuclear power would be the death of all forms of life Leaving uranium in the ground is infinitely better than bringing it up and exposing life to its lethal affects
- The nuclear enterprise consumes more energy than it produces
- Radioactive waste produced cannot be recycled and waste storage for thousands of years is impractical

Nuclear power plants are very complicated and the number of possible malfunctions which can lead to disaster are innumerable. Thus safety of these plants can never be assured.

R. Ashok Kumar
Bombay Sarvodaya Mandal
Nana Chowk, Bombay-7

Nuclear Energy Awareness Programme in Gujarat

The spate of problems besetting operation of nuclear power plants in the country are too well known for enumeration. Despite these horrendous problems nucleocrats are blithely going in for further expansion. Narora-2 and Kakrapar-1 are ready and can become critical any day now. Kakrapar-2 is also nearing completion. Work on Kaiga -1 and 2 and Rawatbhata -3 and 4 is going on apace, while despite great public opposition, Department of Atomic Energy seems determined to site reactors in Kerala.

In view of this, Sampoorna Kranti Vidyalaya, Vedchhi has organised an intensive nuclear energy awareness programme starting from Hiroshima Day and lasting up to Gandhi Jayanti on the 2nd of October. It is envisaged that most of the Gandhian post basic schools of South Gujarat and a few in North Gujarat would have had some exposure to the perils of nuclear energy by then.

The programme began in a remote Adivasi village school of Samba by singing of antinuclear songs and talks by Ms Aradhana and Shri Suren Raut. The same evening there was a slide-show in the Ashram-school at Vedchhi. Functions have already taken place at several village schools including Kalamkui, Vyara, Golan, Rupan, Patal and Samba.

An interesting sideshow was provided by the officials at Kakrapar. Every year since 1986, August 6th is the Gujarat Police Reunion Day at a site some three kilometers from Kakrapar Atomic Power Plant. They gather at this site in their hundreds with all the paraphrenalia including buses, trucks, horses, radio-equipped jeeps, etc., since in 1986 on Hiroshima Day there had been a strong protest against the plant. However as preparation, they make it a point to send a constable or two to Sampoorna Kranti Vidyalaya every day starting from the first week of July. However, by the beginning of August we have invariably been blessed by visits from higher officials including the plant supervisers at Kakrapar.

This had been the unfailing pattern. However, this year more than half of July passed off and there was no sign of the cops. We started feeling somewhat lonely. As the song goes, we had grown accustomed to their face! So we wrote a letter to the plant authorities that as part of the Atomic Energy Awareness Programme we would like to have a slide-show in the plant and could they please arrange for the transport. And lo and behold, our old friend, the sub-inspector from Vyara promptly turned up on the third day and asked us the very same questions that he had last year. Of course the plant authorities have not yet deigned to send us any reply to our letter, but this year the "show of force" at Kakrapar was so impressive that even some normally sedate Gujarati newspapers felt constrained to utter a mild reproof.

Sanghamitra Desai Gadekar
Vedchhi, 394641

On Being One in a Million

The 'Science' of Risk Assessment

If your best friend says you are one in a million, take it as a compliment. If a scientist hired by the incinerator industry says it, it might just mean that you are going to die prematurely. Hundreds of people, all "one-in-a-millions," die each year from the pollution from incinerators and toxic waste dumps. To quiet the bereaved and turn this tragic toll into a form of publicly sanctioned Russian roulette, the government and industry are turning to a sham science called risk assessment.

What risk assessment provides is a number—"six additional cancers among 100,000 most exposed individuals," for example, as a result of having 25 truckloads of dioxin-contaminated industrial waste burned each day in the incinerator next door. The number is often accompanied by a comparison - "you take a greater risk from radiation received during a long plane flight." This one-two punch is designed to disarm the opposition. After all, what kind of a wimp wouldn't accept that small risk in exchange of myriad benefits-jobs and "security"-that such an incinerator would bring to the community.

Well, me for one. And here's why. First of all the numbers that come out of a risk analysis depend on the accuracy of the numbers that go in. To put it bluntly, the people that plug in these numbers don't know what they are talking about. Incinerator emissions contain close to 100 different chemicals, only a few of which have been analyzed for their effect on humans. These analyses, always controversial, are continually being revised. As for the rest of the chemicals, science draws a blank. And what impact these different poisons might have when combined is anybody's guess. Such Combined effects have never been studied.

The other question that needs to be asked is this: what risk is being assessed? Usually it is cancer-a grim and unpleasant threat, to be sure-but cancer is not the only hazard out there. Among the many other health effects caused by the murky soup of environmental pollution are birth defects, immune system damage, developmental disabilities, organ damage and a host of other sub-lethal impacts that are far less well-documented. And the standard member of the public these assessments are designed for is a 30-year-old-white male. Granted, there are lots of them, but they are the least vulnerable to toxic assaults on their health. Left out are infants, notoriously more sensitive to pollution, the aged and the already sick.

With all the uncertainties one ultimately finds that a risk analysis can be made to produce almost any conclusion. As one wag put it, risk assessments are like political prisoners-torture them enough and they will say anything. The essential variable it turns out, is who pays for them. The U.S. Environmental Protection Agency (EPA) discovered this fact in the mid 80s when it decided to let private corporations do their own risk assessments of toxic waste dumps on their premises. Suddenly, sites you wouldn't fly over were deemed suitable for picnics, with all the evidence packaged in neat and convincing scientific papers. Shortly thereafter, the EPA quickly took back its assessment responsibility-private analyses, one regulator declared delicately, proved "hugely optimistic."

Politics and uncertainties aside, however, the use of risk analyses as a means of crafting public policy raises larger social questions. Is it right, for example, to permit one segment of society to impose "risk" on another? Why should a scientist hired by a corporation have the right to declare

10 cancer deaths in a community "acceptable," while baiting the victims with the promise of jobs? And is it not my right to voluntarily accept the risk of the small dose of radiation received during a long plane flight, but not accept the risk imposed on me, even if some scientists tell me it is smaller, to have a nuclear waste dump next door?

Science serves us when it is devoted to improving our lives, not when it is used to hide bad environmental policy. After all, which would you rather have-a $100,000 risk assessment telling you that the $30 million municipal incinerator proposed for next door will kill only one of your neighbours each year, or a $1 million recycling programme that will make that incinerator unnecessary?

Andre Carothers
Editor Greenpeace Magazine
Source:E The Environmental Magazine May/June 1991

Czechoslovakian Contamination

The MAPE uranium mill at Mydlovary near Ceske Budejovice has been the cause of severe radioactive pollution dating from the early 1960s. Up to 80 percent of the cattle grazing in the neighbourhood of the facility died in 1962/63 from leukaemia or deformities because of an accident which took place in the early 1960s but has been kept secret till now. The only precautionary measure the authorities took at the time was to close down a drinking water well without informing the people as to the real reason behind the move. Another spill occurred at the same site in 1964 and there have been several instances of malfunctions thereafter. News of the second accident was made public by Ministry of Agriculture officials in a Prague newspaper *Mlada Fronta*, just two days after Greenpeace released information regarding the first accident.

The catastrophic situation created by the first accident was only discovered after the increases in the cases of leukaemia and mutations were monitored with cows in the vicinity of the plant. The area around MAPE is used intensively for agriculture and livestock breeding, mainly cattle, geese, fish and hops. In 1962/63 officials from the regional slaughter house commissioned veterinarians from the Veterinarian Institute in Budejovice to find out the reason for the sudden increase in leukaemia and mutations. The results clearly indicated that only radioactive contamination from MAPE could be responsible. Documents relating to the investigations were immediately declared top secret.

Pollution continued during the succeeding decades, through the "normal operation of the mill." Between 1965 and 1j985 radioactive waste water of the mill was released directly into the Vlatava river. Since 1985, radioactive tailings and waste water have been released into former open-pit coal mines right next to the mill. Greenpeace, which is demanding an investigation of the situation and is conducting a campaign in surrounding cities and villages, has received official analyses from the Czech Institute for Hygiene between the years 1979-81: the eight control points located in a circle of eight kilometers around the plant showed significantly higher measurements of radioactivity. The official reaction: four control points where the largest readings were recorded were shut down.

Since the mid 1989 the MAPE uranium mill has also treated the uranium ore from the West German Menzenschwand uranium mine. This deal was made after the closure of the only West German uranium mill at Ellweiler, for excess radon releases. Questions raised by the Greens in the West German Parliament on radiation standards of the Czech uranium mill were answered by the statement that the West German Government supposes that the Czechoslovakian Government was observing international standards...

> *Eight control points showed significantly higher measurements of radioactivity. The official reaction: four control points where the largest readings were recorded were shut down.*

On 21 January 1990, some 500 uranium miners gathered at Pribram, which is one of the mining centers in Czechoslovakia. They were demanding disclosures of the dangers posed by radiation to their own health. They had no confidence in the administrative staff of the mines and the health department which have remained unchanged since before the revolution.

There are about 30,000 people employed by the Czechoslovakian uranium mining industry. About half of them work in underground mines and mills. It is known that although many workers came to the mines because of the high wages offered there, prisoners have been forced to work there. Working in the mines (for ten years) is also offered as an alternative to conscientious objectors to avoid compulsory military service.

After 3200 working shifts (somewhere between 15 to 17 years) underground, workers are employed on the surface-but this is also dangerous since high levels of radiation have also been recorded in some of the offices and in parts of the mills. Workers retire at the age of 55.

A former uranium miner who had worked for thirty years beginning in 1947, said, "We were a group of eighteen. Seventeen of us died of lung cancer. I am the only one who survived." Another miner was quoted as saying, "When they found a radiation induced disease in my blood, they did not tell me the results of the investigation They made false diagnoses to prevent recognition of an occupational disease."

Greenpeace Indicts French Nuclear Industry

The French nuclear power programme, upheld throughout the world as an epitome of success by the nuclear industry, has come under scathing criticism in a new report from Greenpeace International. The 136-page report, written by economist and political scientist Dr Francois Nectoux, focuses not on safety issues-though they are peripherally addressed-but on what is supposed to be the French industry's pillar of strength: the economics of the programme.

According to Nectoux, Electricite de France (EDF), the nation's nuclear utility, suffers from the world's largest private debt, which Nectoux places at $38 billion (other reports have put the debt at over $40 billion). Nectoux sees little chance that EDF will recoup the debt, and indeed points out that France currently has substantial over-capacity (about eight large reactors worth), even while EDF considers ordering several new large reactors in an effort to preserve its scientific infrastructure. Since 1974, Nectoux argues, EDF has shown losses of 30.2 Billion French Francs and profits of only 2.7 Billion Francs.

Nectoux also points out that French electric rates, while cheaper than Germany and Italy, are more expensive than Denmark or the Netherlands, and are comparable to the U.K. once artificial trade barriers are discounted. Moreover, Nectoux argues that the rates would be even higher without the presence of a significant portion of very cheap hydropower.

Two other issues of great interest to U.S. (also to India - Editor) are also brought up in the report.

The first is that EDF has been unable to maintain its 1970s construction schedule of five years for completion of a large reactor, casting severe doubt on the ability of the much less centralized U.S.industry to build reactors in a similar time frame. The U.S.industry argues it can complete reactors in five years, which is essential to its ability to provide nuclear power in an economical manner.

The second lesson is France's experiences with its standardized reactor designs; essentially France has two designs, a 900 MW Pressurized Water Reactor and a 1300 MW Pressurized Water Reactor. But as critics have frequently pointed out, flaws in a standardized design affect not just one reactor, but all of them. In France's case serious steam generator problems have plagued both of its designs, leading to costly repairs and a greater risk of accidents.

For more information on the report contact:
Greenpeace,
1436 U Street NW,
Washington DC 20009, U.S.A.

Source: The Nuclear Monitor July 15, 1991

LETTER BOX

I am undertaking some research work on the Indian nuclear fuel cycle and would like help with some specific information.

- In the July 1991 edition of *Anumukti,* there is an article "Chernobhata", relating health effects form the Rajasthan Atomic Power Plant on the surrounding villages. Do you have any further evidence of health effects relating to this or other plants in India?
- In many countries with nuclear energy, the nuclear industry is undertaking a large public relations exercise in order to try and convince the public that nuclear power is an important energy source. Has the industry in India started any public relations exercises like this?

Antony Froggatt
Greenpeace
Canonbury Villas, London Nl 2PN
U.K.

As you may be already aware, we have started direct struggle against Peringome Nuclear Power Plant. We understand that the site selection committee has recommended this **place as *one of the best possible sites in the world.***

On Hiroshima Day, thousands of people courted arrest while picketing various government offices in Peringome. We are also getting full support from renowned editors, writers, intellectuals and even political party leaders, both from the right and left of the political spectrum.

New, though not unexpected, developments include the recent stand taken by the Communist Party of India (Marxist) (CPM) State Secretariat which has for the first time come out openly against the struggle and has denounced it as "ill-motivated". Though CPM secretariat has lost much of its bureaucratic teeth in recent years, there is no doubt that many of the people in and around Peringome do owe allegiance to that party. There is no doubt that the tone of gross callousness and insensitivity reflected in the statement will not go unnoticed by the people and the stand taken on just this single issue alone may spell disaster for the party. A noteworthy point about the action on August 6th was the fact that it was inaugurated by a veteran CPI leader, K.V.Surendranath, Ex MLA and the struggle is being led by mainly members of SFI and DYFI (both CPM oriented organisations).

K.M.Venugopalan
Annur, Payannur 670 332
Kerala

The struggle against the proposed Peringome nuclear power plant will be an uphill task since there are no evacuations involved here.

Thousands of acres of government land is available. The fact that all the major political parties, whether of the left, right or center are in favour of the plant's construction, presents one of the biggest hurdle to the agitation. At the same time Dr P.K.Iyengar, the head of Department of Atomic Energy, seems determined to establish the plant as a 'gift' to his home state. The government and the Kerala State Electricity Board are all for the establishment of the plant and anyone who speaks against nuclear power is dubbed anti-national. It is against such heavy odds that we have to fight here, as elsewhere.

K. Ramachandran
Payyanur, 670 332 Kerala

In Alabama and U.S. Southwest in general, also in the Southwest, we too are working very hard on the nuclear issues. In the U.S. we are very concerned that "obsolete" missiles are discussed for dismantling but simultaneously new, far more accurate and destructive missiles are being produced and loaded onto nuclear submarines in Bangor, Washington and Kings Bay, Georgia. This is the Trident II or D-5. We are very active on this issue as well as on the transshipment of hazardous nuclear wastes. The only thing to do is to stop now all the production, shipment and deployment of nuclear weapons. It is unfortunate that this trip I am not so free to be able to move around much. Otherwise I would dearly love to come and visit your institute at Vedchhi again. It has really been the inspiration for the development of our tiny project in New Mexico.

Dr Jane M Christian
Centre for Applied Linguistics
University of Hyderabad
Hyderabad AR *500134*

SAHAJA, a women's group here, is conducting a two-day seminar on "Energy and Women". Our group, Women Against Nuclear Energy is presenting a paper entitled, "Nuclear Issue is Also a Women's Issue ". The seminar will be held in the last week of August. We shall welcome any comments, so that they can be circulated amongst the participants.

The study being carried out on the genetic effects of high background radiation in Kerala is almost finished and we hope to have it published within a couple of months. The preliminary work on the study of cancers in Kanyakumari has already begun.

I am planning to work on a project, "Environmental Issues and the Judiciary". It will be for a period of two years. If you have any materials related to this topic, for example, the legal struggles here and abroad, please send me a copy.

K.Nandini
CISEC Kottamukku,
Kollam 691 013
Kerala

Koodankulam is going ahead in Tamil Nadu. There is no organised resistance, no one really understands that we are importing our own Chernobyl. The local people have no clue what atomic power is. We need a concisely written article explaining it so we can produce from it a leaflet in Tamil with a brief English summary. I can find some local funds to print and distribute it. Also, can some whiz kid design a good, imaginative, hard-hitting anti-nuke sticker — we could print Tamil and English versions. I will raise part of the money do do a run of 5-10 thousand. We may not be able to do much, but we can't sit quietly by!

Rom Whitaker
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Drafts should be drawn on State Bank of India Valod (0531)

Editor: Surendra Gadekar

Subscriptions, donations, manuscripts, inquiries regarding circulation, etc. should all be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printry, Ahemedabad

PRINTED MATTER **BOOK POST**

ANUMUKTI
A Journal Devoted to Non-Nuclear India
Volume 5 Number 2 October/November 1991

A Grim Tale From The Nuclear **Fairyland**

A Heavy Whitewash

On 27th of July, there were barrels of heavy water which needed upgrading, standing in a corner of the upgrading plant building. The building was to be whitewashed and a contractor had been assigned the job. One of his labourers, Shri Madholal, who was to do the actual whitewashing found that there was no water in the taps. He made the wash in the barrel of heavy water and then proceeded to put a coat of whitewash on the walls of the room. After finishing his work, Shri Madholal washed his brush and then washed his hands and face with the same heavy water. The report said that in the process about 40 litres of heavy water worth Rs 250,000 was contaminated and thus wasted.

As soon as information regarding this event reached the authorities, there was consternation and panic amongst them. The new coat of whitewash was scraped off the walls and sent off to the laboratory for tritium analysis. Shri Madholal immediately disappeared from the scene and his whereabouts were unknown. The chief suprintendent of the power station, Shri T S V Ramanan, even while admitting the veracity of the incident insisted that the quantity of heavy water lost was very small. According to him Shri Madholal had only washed his brush in the heavy water but had not used it to paint the walls. No other officer at the plant, besides Mr Ramanan was willing to talk at all about the incident with news correspondents.

Rajasthan Patrika 21.8. 91
Dainik Navjyoti 21.8. '91
(Translated from Hindi)

Editor's Note:
Indian nuclear reactors use heavy water in large quantities for cooling and moderation. The coolant heavy water is circulated under pressure and quite often it leaks from the pipes on to the floor of the reactor building. Heavy water is extremely expensive. The Comtroller and Auditor General of India had estimated in 1988, that a kilogram costs Rs 13,400. In fact using the C.A.G.s figure the cost of 40 liters would be more then 5 lakhs, but that is besides the point. I mention it only as an illustration of the petty kind of chicanery, the

nuclear administrators do to minimize damages caused by information leaks. But it is indisputable that any heavy water which is lost is a great financial burden and great efforts are made to recover all leaks and spills. But, despite all effort some heavy water cannot be recovered. It is important to make this point because nucleocrats have now started claiming that "Every drop of heavey water is collected. (See Lies, Damned Lies and Nucleocratic Explanations on page 7 of this issue.)It has been reported that the Rajasthan unit-1 reactor's spillage is of the order of 95 tonnes a year and the recovery is about 78 tommes a year. The other 17 tonnes is lost to the atmosphere. That is, around 45 kg, worth more than Rs 6 lakhs in 1988 prices is lost every single day. Similarly unit-2 loses around 10 tonnes of heavy water every year.

Used heavy water is radioactive since neutron bombardment experienced by the molucules of heavy water result in the production of tritium which is radioactive. It can also be contaminated with ordinary water and this severely affects its neutron absorbtion properties. Thus the heavy water which is recovered from the reactor building needs to be upgraded-that is brought back to requisite purity-so that it can be reused in the reactor. This is done in an upgrading plant situated in the heavy water plant complex.

The incident well illustrates the lax safety procedures and the lackadaisical attitiude towards the safety of their own lower rank workers obtaining amongst officers in nuclear establishments in India. The people who do the actual work are often casual labourers employed on a temporary basis through labour contractors. They are given no training whatsoever and have no understanding of the hazards involved. Supervision is at times non-existent. The major effort of the authorities, on those rare occasions when a failure of the information security system does throw the glare of public scrutiny on them, goes in trying to play down the seriousness of the consequnces. And it is the Madholals of the world, who have to pay the costs of this wretched system. Not only does this poor man, loose his only means of a meagre livlihood, no serious effort is made to trace him and help him medically since there can be no doubt that he at least has ingested measurable quantities of radioactive tritium. The only loss that bothers the authorities is that of their precious imported heavy water.

From The Editor's Desk

Many years of my life have been spent "doing research" in Physics. Some would prefer the word wasted, but I don't subscribe to that view. Doing research meant many separate actions: sitting in air-conditioned comfort in a library and readingjournals and books; talking and discussing ideas with friends till early hours of the morning; sitting with a pen and paper (usually backs of used computer sheets) trying to come with a theory to explain the phenomena of interest and so on. Usually I ended up just doodling pictures, but by and by I learnt the tricks of the trade and became fairly adept. Not by a long shot in the first rank, but able to get along and be accepted as one of their own by most of the physics biradari.

The research that I did do reflected the priorities of the international physics community. Phase transitions and critical phenomena, dynamical theory of glasses, charge density waves, 'and so on. All rather interesting and great fun to do, but even I would not claim that my doing this work had any relevance to the lives of the common mass of people whose taxes were paying for it. What kind of research should the state sponsor is a complicated question and something of a Pandora's Box and anyway is not of immediate interest to readers of *Anumukti.* But over the years, I often wondered if it would be possible to do research which would be of immediate relevance to people's lives and how to do it and who would pay for it. The health survey of villages around Rawatbhata and Rampura that we organised in September was a small attempt at doing people oriented research. We could not have done this work at all without the great help rendered by many different groups of people. In this issue we have a report regarding how the survey was done and also about the reactions it engendered amongst nucleocrats. The analysis of the data that we gathered is being done and we ought to have complete results by the middle of February at the latest.

An Apology

This issue which should have been out by the beginning of October has become so late that it is a shame and a scandal. People have started wondering if they have received 'mukti' from *Anumukti.* No apology can suffice. My only excuse is that we have been overwhelmed by work. However the important point to consider is how to get back on the regular schedule. What we intend to do is the following: get the next issue out by January 25th, 1992 and then a double issue focussing on the Rawatbhata health survey analysis by the 15th of March. We will not bring out a separate April/May issue and then resume regular schedule of publication with the June issue.

Mohan Parikh 1922-1991

'Monnai' was a versatile genious who accomplished more in one lifetime than what most can manage in many. He was an inventor, a designer, a popularizer of science, a teacher. He took science to the villages not through writing books and articles but by designing and producing tools and implements which would be of direct use to people. His passing away is an immense loss to the worldwide movement for an ecologically sensible and humane alternative society. The loss to Anumukti and to me personall;y is even greater.

A Report on the Rawatbhata Health Survey

We first went to Rawatbhata in April, 1990 at the invitation of the Parmanu Pradooshan Virodhi Sangharsh Samiti, which was a body formed by Sarpanches often villages around Rawatbhata. Despite the name, this was not an antinuclear group. The invitation to us was the proverbial clutching at straws when drowning. They had originally invited us a year previously,.but then had later cancelled the invitation. This cancellation had been done because the RAPS (Rajashan Atomic Power Station) authorities had promised to look into their complaints on the condition that they would cancel their invitation to antinuclear groups to come to Rawatbhata. Their demands were the usual demands of people with respect to development projects: When would we taste the fruits of development. They wanted jobs, schools, roads, access to medical facilities... One of the points they made was the fact that even after seventeen years, the village on whose lands the reactors had been built, (Tamlav) had still to receive electricity connections. (See Sunil's article *Rawatbhata: Development Brings Dissatisfaction* in *Anumukti* Vol.3 No.5, April, 1990)

Our report about the visit *(Chernobhata* ?) was published in *Anumukti* Vol.3 No.6, June, 1990. It received a good amount of national and some international publicity. During the last one and a half years, other newspapers sent reporters and photographers to the area and they have published a number of reports. A British journalist, Christopher Mitchell made a clandestine film, "The Price of Power", which was shown on channel-4 in Britain on April 2, 1991. Excerpts from this film along with an interview with the Secretary, Atomic Energy Regulatory Board (AERB), Dr. K.S.Parthasarathy, were shown in the September edition of "Eyewitness"—a videomagazine brought out by *Hindustan Times TV*. The release of this video caused quite a commotion with questions being asked in the parliament and the subject remaining in the news for quite a few days running.

Nuclear Santa Claus

The glare of publicity has caused some movement in the usually slow moving government machinary. For example, just since May 1990:

- Electricity connections have been made to some houses in one hamlet of Tamlav.
- The authorities have admitted that the water in the wells and in the ponds may be contaminated and have warned the people not to drink it. A pipeline extending well over a few kilometers has been laid to supply the villagers with potable water and a tank has been built in Tamlav to store the pipeline water.
- Apointment of a compounder and an auxiliary nursing midwife has been made to the village dispensary of Jharjhani and they are residing there at present.
- While our survey was in progress the state government announced that it was converting this village dispensary at Jharjhani into a primary health centre and a resident doctor would soon be posted there.
- Some local youths have got permanent jobs in DAE (Department of Atomic Energy) run establishments.

Besides the DAE authorities have within the last year promised:

- Rs.50 lakhs towards the construction of a local referral hospital at Rawatbhata.
- Rs 50 lakhs to the road department to construct all-weather roads linking some of the villages with Rawatbhata.
- Rs 22 lakhs to the forest department for aforestation of the denuded hill slopes around Rawatbhata.

I am not claiming that this downpour is only due to the publicity generated by our trip, but the fact remains that DAE and the State Government had not done any of this during the last seventeen years after the plant was established but did do it during the last year and a half. At the same time, DAE mandarins and some nucleomaniacs in the press started a systematic campaign of trying to discredit the observation that there is something unusually wrong with the health of the people around Rawatbhata. (See Lies, Damned Lies and Nucleocratic Explanations on page 7.) Therefore, it became more and more necessary to find out some basis for objective assessment rather than relying solely on subjective evaluations of different 'biased' individuals.

The Basic Difficulties

For the past year we had been trying to persuade various indepedent organisations who had expertise in the matter to conduct a door-to-door survey of the area. We felt diffident about doing the survey ourselves since we had very little expertise and virtually no resources to undertake this task. Unfortunately no organisation came forward to do this work on their own. Some organisations, who did show an interest, wanted to submit project proposals and get approval and grants from the government before proceeding. However, government approval essentially means approval from DAE and they have been notorious for delaying grant of approval for such surveys. For example, they delayed for five years before giving grants to South Gujarat University for making a baseline health survey of the area around Kakrapar nuclear power plant.

At the same time there were repeated requests from the people around Rawatbhata and they promised all possible help in carrying out the survey. Also, at the Bangalore meeting of antinuclear groups in April 1991, (See *Anumukti* Vol.4 No.6)there was strong support for the idea of conducting the survey. It was all these things together which helped us to decide to do the survey ourselves.

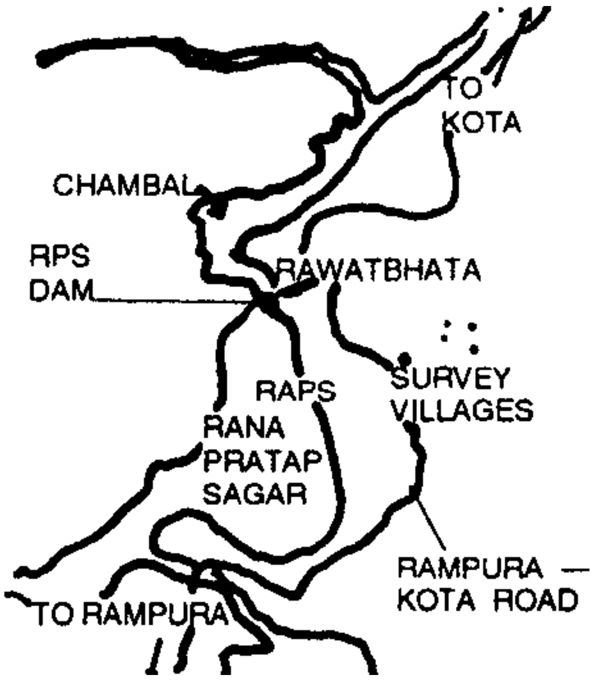
Not having done a survey ever before we were totally ignorant of the difficulties involved and had no inkling of the different kinds of organisational skills required. Now that the data collection part of the survey has been successfully completed, I don't mind admitting that without expert help, there is a good chance that we would have made a fine mess of things. But fortune favoured us and we had a very lucky break in the form of a chance meeting with Dr Leela Visaria of the Gujarat Institute for Area Planning. She not only helped in the design of the survey schedules but also sent two absolutely invaluable investigators to help conduct the survey. Shri Vinayak Dave and Ms Ila Mehta not only taught us a good deal but also took care to see that the survey was properly conducted and no household was inadvertantly left out.

The second great constraint was money. We toyed with the idea of applying for a research grant, but gave that up due to considerations of the time and effort involved in obtaining one. Then we had a happy thought. First of all reduce expenses to the absolute minimum and then share the burden so that no single entity gets too much of a load. It was decided that all investigators would volunteer not only their time and energy but also contribute their travelling expenses; boarding expenses would be the responsibility of our local hosts in the villages and at Rawatbhata and expenses such as publication of schedules and on medicines and other equipment would be borne by the *Anumukti* group. We made an appeal for both volunteers and donations and the response was overwhelming and far beyond our expectations.

Communications posed a severe problem since the survey was a joint cooperative effort involving many people most of whom lived far apart. We were not able to solve this problem satisfactorily and I think that if there is to be any future survey, central coordination needs to be done from some metropolis with adequate communications. Originally the survey was fixed for 11th of August, but that had to be postponed with very little notice. Even with just a week left there was no information if the survey schedules were printed or not; (they were not) or if any volunteer was coming for certain. Even the notice of postponement which we sent by telegrams did not reach some friends on time and three doctors from Indore and an investigator from Hoshangabad made a vain trip to Rawatbhata.

The Terrain

The reactors are situated on the banks of Rana Pratap Sagar—which is the reservoir formed the dam of the same name on the Chambal. But for Rawatbhata township, the area is sparsely populated. The villages selected for the survey were Tamlav, Deeppura, Malpura, Bakspura and Jharjhani. The reason these villages were selected was that they lie in an East-North- Easterly direction from the plant and during the monsoons they are directly downwind. Except for Tamlav, which lies closest to the plant all the others are situated in a canyon called the Kundal. Deeppura and Malpura lie just in the beginning of the valley and the walls of the canyon are very close to these villages whereas Bakshpura and Jharjhani are further within the valley where it has opened up. There are other villages further down and there have been some reports of genetic abnormalities in children from some of these villages, but we did not include them in the survey, since to have done so, would have meant increasing the size of the population covered rather substancially. That would have made the survey well beyond our capabilities.



For the sake of comparison, we chose four villages Khetpalia, Dhoodhlai, Anandipura and Chandrapura near Rampura in Mandsaur district of Madhya Pradesh. These villages are a little more than 50 km distant from the nuclear power plant. Our reasons for selecting these villages was that they have similar size, and caste composition and are yet distant enough (we hope) from the nuclear power plant. In all we have covered a population of little less than six thousand—of these some three thousand one hundred are near Rawatbhata and two thousand seven hundred in the control villages.

The data that was collected provides information not only about health of the people but also things like where they were born, their educational status, employment, births and deaths within the last two years in the family, pregnancy histories of all women of child-bearing age, land holdings, fertilizer and pesticide use, animal holdings, nuitritional status... Thus, we hope not only to compare the health of the people in the near vicinity and those farther away, but also try to see what positive difference this giant nuclear enterprise made to the economic status and prospects of its neighbours. Isn't that what development is supposed to be all about?

The Volunteers

There were three separate groups of volunteers but they all shared one quality—unbounded vigour and enthusiasm for work. It was indeed a revelation to see this kind of dedication. There was a group of eighteen college students from Delhi some of them post graduate students. They came in two batches, being unable to stay for the entire duration of the survey due to exams and other academic committments. The other group were students of the Rampura college and they did all the work in the control villages. There were two volunteers from Hoshangabad. Another group were eight doctors from different parts of the country who came for the last few days and helped by diagnosing the different ailments of the patients.

The Nitty Gritty

Each and every household in the selected villages had to be identified first. To do this every house was numbered. Since we wanted the numbering to last for sometime in case a revisit was needed later, a small metal numbered disc was nailed to the front door of every house. Next a volunteer would write down the name of the head of the household and the total number of family members. A third person would at the same time draw a map of the village and place the house in the context of the map. All this had to be accomplished before any survey questions could be asked. Sometimes even this seemingly straightforward task could present unexpected difficulties. In Deeppura one day, all of us were astonished to see a group of people emerging from what looked like a field of tall corn. Further enquiry reveailed that we had completely missed four houses since they did not have any visible entrance, being surrounded by fields on all sides.

The numbering had to be logically consistenet and the logic had to be apparent to someone who had not participated in the numbering process. Remarkably, this was accomplished so successfully that later on some villagers approached us with a request for a copy of our list, because they said the village panchayat numbering was inaccurate and inadequate and they would prefer to adopt our more systematic approach.

For the filling of survey schedules, a team consisting of a male and female volunteer each was assigned houses according to the map. Quite often there would be nobody at home and repeated visits had to be made. We had to reach the village almost at dawn since by 7.30 A.M. most folk would leave for work. Thus the most productive times were early mornings and late evenings. Women in the family were the more crucial contact since only they could give us details of pregnancy history. Since women are the most overworked group, having to work both in the field and at home, answering our persistent and seemingly never ending questions was an additional impostion. But they cooperated most wonderfully and answered all the questions with exemplary forebearance. Sometimes, especially initially, there were communication problems due to the local Mewari dialect, but luckily most local youth did follow and speak Hindi and after a few days the volunteers had picked up enough to get by.

A Typical Day

The day would begin usually around 4.30 in the morning since we had to getready and catch a bus or hitchhike on trucks to reach the villages early enough. The house numbering, listing and map making team would start on a new village while the scheduling team would fill schedules in previously numbered and listed area. Quite often, some villagers would think of us as some kind of undercover government agents, who had come to do 'Nasbandi' (Sterilization) and refuse to answer any questions. This happened more often in control villages since there the local medical authorities had very kindly and generously provided us with transportation. In such cases one had to explain to them what the survey was about and persuade them. At times this could be a severe test of persuasive skills. But finally, there wasn't a single instance where a family did not consent to answer questions. In some cases people mistook us for people who would provide them with land deeds. In these cases too, the false hopes had to be removed.

An air of uncertainty hung regarding lunch, though our hosts in Rawatbhata went to extraordinary efforts to provide us food on time. I don't think anybody ever went hungry, but lunch wasn't something you could count on.

A lot of time was spent walking large distances during repeated visits to a house whose residents had gone out for work. Vinayak had the most work, since he had to keep the whole thing coordinated, distribute new house numbers to those who were unable to locate people in their assigned houses and then keep track that no house was left out and that there was minimum duplication.

By the time we got back to Rawatbhata in the evenings, hitching a ride back on trucks, it was around 9 P.M., and all of us were dead tired. A bath and dinner and most of all sleep was a welcome prospect. However, before one could go to bed, one had to complete anything left unfinished in the schedules and also meet together to discuss the problems encountered during the day and take the next days assignments. We rarely managed to get to bed before midnight. Tommorow was already upon us.

Initially there was some culture shock, since city-bred volunteers had previously very little experience of extreme poverty and the lack of sanitation in the villages. But the warmth with which the villagers welcomed us soon won us over and we decided to stay in the villages to avoid the trasportation hassles. We were treated so royally well that we felt like 'baratees'. I ate some of the tastiest meals I have ever eaten.

But my best memories of the survey are connected with the truck rides back to Rawatbhata in which there was a lot of singing and some incredible feats of balancing on a fast moving truck without any kind of hand-holds. It was this spirit of bonhomie and unfailing good cheer that has established strong feelings of comradery between all of us.

Another positive side effect of the survey was that all the volunteers who came to Rawatbhata, none of whom had any previous strongly held antinuclear convictions, became ardent antinukes. The days spent at the survey counting diseases and watching stark poverty face to face and contrasting this scene with the monster development project nearby was the best possible education on the 'benefits' of nuclear energy. Any 'free' time was spent discussing all aspects of nuclear energy production and distribution. It was without doubt the best nuclear energy awareness camp that I have ever attended..

A Special Problem

Despite earlier fears to the contrary, there was no direct attempt by the authorities at stopping the survey. However there were rumours and scares aplenty. Informers and CID's were a constant bother. Probably the reason their was no direct attempt at stopping the survey was the fortunately bad relationship between the RAPS big bosses (their overbearing attitude hasn't made them loved) and the local administration. However, this is just speculation on my part. The RAPS authorities did succeed in forcing the local administration to take some 'action'. This action essentially consisted in putting pressures on our local hosts. They were repeatedly harassed and questioned regarding the identity and the bona-fides of the volunteers.

The Last Days

After completing the work at Rawatbhata we went to Rampura. By then the volunteers had become veterans and knew the codes in the schedules like the back of their hand. Unfortunately, this was the precise time that most of them wanted to had to return. They postponed their departure by a few days and helped in training the students of Rampura college in filling the survey forms. The work at Rampura, was just as busy as Rawatbhata, but it was easier and better organised. The local medical authorities had given us a vehicle, so getting to and fro from the field area was no longer such a hassle. These student volunteeers of Rampura, astonished me most of all. I suppose it is my elitist attitude, but I expected the volunteers from Delhi to do all the enormous amount of work they did and bear all the hardships involved without complain. But to find the same dedication and deligence in students from a small almost semi-rural college was a very welcome surprise.

While the work in Rampura continued, some of us had to get back to Rawatbhata, since the group of volunteer doctors was arriving. We wanted them to check all the cases which had been identified in the survey and confirm the diagnosis. But by then we were part villagers ourselves and invited ourselves to stay in the villages. The doctors not only went to every house diagnosing, they also had to distribute medicines and to listen to all kinds of complaints.

On the last day, September 22nd 1991, we requested The Kota Cancer Society and The Mahavir Vikalang Society to organise a cancer detection and a prosthetic camp. They organised two: one at Jharjhani and the other at Rawatbhata. There was great enthusiasm in all the villages about these camps and there was such a great rush of people that it almost overwhelmed the arrangements. A number of polio victims were provided with calipers and artificial limbs, a number of biopsies were conducted of people suspected of suffering from cancer.

Right now we are making the schedules computer ready. Once this task is completed we can put all the data in a computer and get correlations between different variables, and then finally the analysis can begin.

Acknowledgements

There were so many people whose unstinted help and cooperation made the survey possible that it is difficult to know where to begin giving thanks. Unfortunately, I cannot publish the names of many, especially those who live in and around Rawatbhata because I do not put it past the RAPS authorities to 'punish' them for this effrontery.

The help given by Dr Leela Visaria and the Gujarat Institute of Area Planning, Ahemedabad in design of the survey was what allowed us to even think of undertaking the survey in the first place. The Institute is also doing the analysis.

Rajeev Singh, Ratna Mathur and Nivedita Menon of the Network to Oust Nuclear Energy, were responsible for recruiting the volunteers from Delhi. It was Ratna's will to see the survey through which gave us a new impetus at a time when we were feeling rather depressed following the first postponement. Rajeev and Ratna did so many things that it would take pages to just enumerate them. Similarly crucial was the role of Shri Ram Pratap Gupta of Rampura College, who not only made all the arrangements there but also had to convince the villagers of the desirability of having the survey. Ms Sudha Hardikar put us all to shame since she not only did all the work that was assigned to her but like Oliver asked for more!

I cannot complete this article without mentioning two names from Rawatbhata. They have already suffered so much harassment that they are immune to any further provocations. Jaan Mohammad Saheb not only opened the doors of his hotel to us, he opened the doors of his heart. And more than anything else it was the courage and the perseverance of Shri Ratanlal Gupta—Sarpanch of Rawatbhata, which carried the survey through.

Lies, Damned Lies and Nucleocratic Explanations

The release of the September edition of "Eyewitness"-- *Hindustan Times TV's* videomagazine was a media event in itself. No event in recent memory has caused so much consternation among nucleocracts and their acolytes. The video showed a ten minute clip depicting a small sample of the health problems of the people around the Rajasthan Atomic Power Station (RAPS). There has been a veritable flood of press statements, explanations, denials, issuing of clean chits to RAPS administration by their bosses, and numerous articles in various newspapers. There is a common thread through all this outpouring and since it is part of a long running systematic campaign, it might be worthwhile to analyse its main points.

Defense in Depth

The main idea which governs the safety of nuclear reactors is called defense in depth. The idea being that there should be so much redundancy in safety features, that if some particular feature fails to function, the safety of the whole system would not be treatened since some other safety system would work and there would be no leakage of radioactivity to the environment. A similar defense in depth strategy seems to be the governing principle in the attempt to plug the leaks of information to the general public.

However, despite all the redundancies, safety systems have been known to fail. In case of failure and the leakage of radioactivity to the environment, the governing principle is called damage limitation. The same priciple seems to be in operation with regard to information leaks. Like a game of chess, the arguments of the pronuke lobby have a discernable opening, middle game and an ending.

No Health Effects At All Opening

Stout denial is the name of the game. The dominant theme of the pronuclear argument has been to deny that there are any health effects at all to be seen. It is all a figment of the biased antinuclear (read unpatriotic) imagination. Thus, we have

"Atomic Energy Commission Chairman Dr P. K. Iyengar strongly denied these reports as uninformed and in some cases part of a campaign to stop India from persuing its nuclear research and power generation."
(Hindustan Times 17.9.1991)

Dr D.V.Gopinath, Director, Health, Safety and Environment Group at BARC, was more direct. According to him, *"these reports are based on conjetures and have no basis whatsoever."*
(Hindustan Times 17.9.1991)

To Dr K.S.Parthasarathy, the Secretary of the Atomic Energy Regulatory Board (AERB), and presumably the guardian of public interest vis-a-vis radiation, the health effects are nothing unusual and can be seen in every backyard.

"On an average ten percent of all new born children will have some defects or the other. They include cleft palate and additional fingers. The birth defects recorded in the film can be seen in any village."
(Dr Parthasarathy's letter in *Times of India 24.9.'91)*

In fact, Dr Parthasarathy characterized the film

"It does not raise an issue. It creates a seed of suspicion by deliberate propaganda. It can be dismissed in the light of current scientific information available."
Times of India 13.9.1991

With the big guns booming like this can the acolytes afford to remain far behind

"Cancer is nothing new to this region. In recent times cancer incidence has shown an increase all over, even in regions far away from nuclear power plants."
(Dileep Bhatia - an engineer with RAPP in the Hindi Daily *Jananayak,* 14.10.'91.)

Nothing To Do With Radiation Variation

The stout denial opening has become unteneble since the health of the people in villages around Rawatbhata is so extraordinarily bad that it shocks any unbiased observer. So any reporter who goes and sees for his or her own self cannot but help write about it. Also, newspapers publish pictures which are worth a thousand words and readers can make up their own minds just looking at the pictures. Therefore, the new variation of this opening is not to outright deny the existence of sickness but to claim that it is not due to radiation

. *"Scientific evidence points to no link what so ever between the reported health problems in the villages near RAPS and the operation of RAPS."*

Mr. S.L.Kati, Managing Director, Nuclear Power Corporation in *Finanacial Express* 21.11.1991

"There is absolutely no evidence of radiation, in any dose, leading to polio-like deformities."
R.Ramachandran's article "Who is Right About RAPS", *Economic Times* 27.10.1991
Editor's Aside:
I saw R.Ramachandran's article rather late to reply to it by sending a letter to *Economic Times.* If one wants to read only one pronuke piece on the whole Rawatbhata affair, this is undoubtedly the one to read. It is a committed nucleophile's polemic. The point that he is making in this quotation is that most of the photographs of deformities that have been publicised depict polio victims which according to him cannot be caused by radiation.

Why Not in Hiroshima Counterattack

To firmly establish the fact that whatever health effects that may be visible, they could in no circumstances be due to radiation from RAPS, the next stage in the argument is a counterattack.

The average doses to parents at Hiroshima and Nagasaki were 13,000 times more, than that to the parents in the Rajasthan villages. Since no genetic effects were found among the thousands of children in Hiroshima and Nagasaki, it is unscientific to expect such effects in the Rajasthan villages.

Dr K.S.Parthasarathy in his letter to *Times of India* 24.9/91

If Hiroshima is too far, Mr Kati brings the point closer home

"The reported health problems in a few villages around RAPS had not been evident beyond natural incidence in the plant workers or their families living in the adjacent plant township. It was to be noted that the limits for radiation exposure for occupational workers was 50 times that recommended for the public"

Dr D.V.Gopinath is characteristically more direct. Giving details of the data collected from the RAPS hospital he claimed,

'Among the 10,000 strong population of plant workers and their families, only 30 deaths attributable to cancer had occurred over the last 24 years. The incidence of only 1.3 cancer fatalities per 10,000 per year compared favourably with the national average of four to five cancer deaths for similar number of population."

However, nobody plays this attack better than the Chief Suprintendent of RAPS Dr Ramanan

"If the main mischief maker is RAPS, then why are the children of the plant workers not deformed? I have worked at the Madras Atomic Power Plant for 14 years and at Tarapur for nine years before I came here a few months ago. Logically I am receiving much more radiation sitting on my chair here than a villager at Jharjhani or Tamlav, but am I affected?"

Where is the Smoking Gun Middle Game

Having launched the attack, the next step is to deny that RAPS gives out any radiation at all! So how can it be blamed for whatever radiation related or not diseases that are to be found in its neighbours?

"None of the two hundred and fifty shutdowns of the reactors has caused any radiation exposure to the public. Leakages do happen as in any industrial plant. Every drop of heavy water is collected. (Heavy water costs several thousand Rupees a kilogramme.) All leaks are contained."

Mr Kati puts the same point in another way

*"Generally leaks in the nuclear power plants are misconstructed to be leaks into the environment, which is not true. For example, in the case of the South End Shield leak at RAPS, the leak was that of light water into the reactor building and not a leak to the environment. There are provisions for collection of leakages and its treatment to meet the regulatory requirements on effluent releases to the environment. Recovery systems were provided to recover heavy water leaks from the system into the plant building because of the radioactivity associated with the release and the cost of heavy water. **

SCIENCE is my Lord and Protector Defense

However, as Vishwanathan Anand will tell you, it is not enough just to attack well. One cannot afford to forget about defense. Nucleocrats like saints have a halo around them which visible to their acolytes. This halo has the word science written all over it. Thus,

So much for the Internationally Accepted Limits

The following is a translation of a newsreport which was published in Nai Duniya-a Hindi Daily from Indore. A friend sent me the cutting but unfortunately it doesn't carry a date. This report needs a thorough investigation, because if true, it is a damning indictment of the RAPS administration and their masters the nuclear authorities.

Officers of RAPS, in league with labour contractors have been toying with the health of young local labourers ignoring safety regulations. These contractors employ local youth during the shutdown of the nuclear power plant as helpers, feeders, supervisors etc. for maintainance and cleaning purposes. During the course of this work, these youth receive radiation far in excess of the limits set by international regulatory authorities. These young workers, who have no previous experience of working in radiation fields and who have no knowledge of the possible effects of radiation on health are ready to do anything due to their greed for money.

International regulations limit the dose of radiation to 2,000 mrem in one year. But there are some youths who have received 3,000 to 5,500 mrem during the course of a single day! This is not only in contravention of the international safety regulations but is also dangerous to health. The nuclear power plant records show the dose to be only 800 to 1,000 mrem. The actual dose received by the worker can be measured from the thermo-luminescent-dosimeter (TLD) carried by the worker. The interesting point is that the contractor does not allow the worker to carry the TLD into the plant so the youth have no way of knowing the amount of radiation they have actually received.

Some youth who have worked during shutdown told us that they are made to word in areas with very heavy radiation. Some ignorant youth even discard their protective clothing while working inside the plant. They claimed that anyone receiving 800 mrem during a day receives Rs 1,600. But the contractor calls them for work again, so that the total cumulative dose can become as high as 5,500 mrem. However, only 800 mrem is recorded. To facilitate receiving the extra dose, the same worker is registered in the records with a different name each time.

every atomic energy functionary is by definition, a scientist, whereas antinukes are emotional and shrill. R.Ramachandran says it all

"Scientists complain that what they have to say has gone unheard amid the strident campaign run by antinuclear activists."

However, you may not be sufficiently in awe of the desi variety of scientist. Hence every single report does not fail to mention that the radioactivity releases (if any) are well within *"internationally accepted permissible limits,"*

But in case you are even immune to the immense prestige of internationaly renowned scientists and insists on measurements, Mr S.L.Kati has numbers in plenty

"Environmental Survey Laboratory haa been in operation over the past 19 years. Radiation surveys as well as collection and analysis of 2,500 samples a year of water, soil, food, air and various other products, had been carried out in an area of about 30 km radius around the plant. The average annual radiation dose computed on the basis of actual air and water route releases over the past 17 years has been less than 5.5 mrem per annum, except 1988 and 1990, when it was about 8 and 12 mrem per annum respectively.

Dr D.V.Gopinath puts it succintly

The total radioactivity exposure from all routes, external as well as internal by way of food etc., received by an individual in the RAPS environment has been around 1-1.7 mrem per year. The total background radiation in the area is around 81 mrem per year and the exposure limit for the general public set by international regulatory bodies is 100 mrem per year.

Nobody can say that pronukes are not independent of each other. Their figures certainly are!

Universal Trinity Ending

Nucleocrats do not want to keep us guessing as to the cause of whatever health problems that exist. They already know all the answers! It is malnutrition, unsanitary living conditions and lack of health facilities that are the culprits.

Dileep Bhatia, RAPS engineer even has it on film

"Village women collect drinking water from a pond where pigs are swimming and even a dead dog is floating! We have captured this on film."

R.Ramachandran does not rush to his camera, when he sees a women drawing water. He prefers to quote the Central Water Commission

If the poor health condition of the people reflects anything it is the dismal living, particularly sanitary conditions and near absence of any health care system. For example, the coliform count—as collected by the state government authorities—of the water that is generally consumed by the village population is in thousands and tens of thousands when potable water should have near zero count. The bacteria levels are also very high. These can be the cause of the general poor health conditions making them highly vulnerable to a whole lot of infectious and other diseases.

The Final Check

For the clincher, nucleocrats go back to their opening statement that there are no health effects at all, but now it is not they who are saying it but "independent" experts—doctors appointed by the Rajasthan government to look into precisely these reports.

Pathik Guha reports in *The Telegraph*

"In fact, two independent reports by experts say that the stories regarding radiation malaffects on the population near RAPS are totally imaginary and facts being mentioned do not have even a distant relation to reality. Some highly placed RAPS officials say that the stories being circulated are "motivated". They maintain that villagers are "trying to blackmail RAPS". These people think that through such adverse propaganda they can force RAPS to provide them with more employment and free medical facilities."

I do not intend to write a detail point by point rebuttal of this barrage. However, it is necessary to clear up some persistent misconceptions.

Science as Scripture?

Is science merely the pronouncements of people who style themselves scientists, or is it an activity, a method of searching the truth? If the latter, than anyone who follows the scientific method is doing science, and anyone who doesn't is unscientific despite his or her 'eminence' and position in the scientific heirarchy. The basic tenet of the scientific method is observation. One just has to open one's eyes and see. Would Dr Parthasarathy have closed his eyes when Galileo was dropping his stones from the Leaning Tower of Pisa, because it would have been "unscientific to expect" both stones to fall simultaneously in "the light of current scientific knowledge?"

The Clean Chit Industry

What needs to be done is simple and straightforward. First and foremost, help must be provided to the sufferers. Next step is to find out if there is an unnatural level of sickness. Once that is established, then one must try to investigate the cause of the problem. There need not be a single cause. It could be a combination of different factors. The cause may indeed be malnuitrition, unsanitary livingconditionsand lack of medical facilities. But these facors unfortunately are common to a lot of regions of the country and should not by themselves lead to uncommonly high level of sickness. It may be that all the deformed children have been born to fifty year old women who have married their cousins. But whatever be the cause, it has to be established using the scientific method. The scientific method does not stop at speculation. It provides proof.

Scientific practice also requires one other key ingredient. Whatever be the results they need to be openly published, so that others can examine them and question them and if need be refute them. "The guarantor of truth in science, is pluralism in research, free availibility of information and open critical debate."

Unfortunately, the two 'surveys' carried out by doctors appointed by the Rajasthan Government, do not come in the category of science but instead belong to the clean chit issueing industry. Their work has no scientific value since they have not published it. Hence their methodology of obtaining data remains a mystery. In our country there is no dearth of people who will issue clean chits at the drop of a hat to anyone and especially to someone as rich and powerful as the nuclear establishment.

Hiroshima Red Herring

Whenever one makes comparisons, care has to be taken that the comparison is being done between comparable objects. This is the old apples and oranges problem. Thus, when health of two populations is to be compared to determine the effect of some pollutant, care must be taken that other factors that affect health, are similar. It makes no sense to say that permanent workers at the nuclear power plant, a well paid, well fed, well cared for group does not show similar symptoms as poor, malnourished, unclean water drinking villagers. It would be a great surprise if the health condition of these well to do people was the same as that of the poor villagers. In fact, the claim that cancer deaths in RAPS hospital are much less than the national average is a pointer in this very direction.

Similar is the case of the Hiroshima and Nagasaki survivors. These people are not an ordinary sample of the general population. They had not only survived the bomb, but also its aftermath—a nation devastated by war, rampant disease, a very severe winter and total disruption of civil supplies and medical facilities. To make an assumption that the survivors did not have a stronger constitution than the non-survivors is absurd. This skewed selection in Hiroshima data has obscured the fact that there are other effects of radiation besides cancer. One effect that has been well established, especially after Chernobyl is damage to the immune system. And this immune system damage does result in an abnormally high level of sickness, whether it be polio, T.B., or Anaemia. (See Dr Alice Stewart's article in Anumukti Vol.4 No.3.

A point that needs to be made is that there are many other people living in Rawatbhata township besides RAPS workers. These people are a comparable group to the people living in the villages nearby. A survey can establish whether the assertion that the health effects are visible only in the villages and not in Rawatbhata is true or not. However, nobody has done it. The repeated assertion by nucleocrats that there are no such effects has no basis in experiment.

However, as an aside I would like to make some comments on this very low rate of cancer mortality in RAPS hospital, since it does illustrate the nuclear mindset rather well. The number is a fraud. It would make sense if each and every member of RAPS staff or any of their family members would go only to this facility in case of terminal cancer and go nowhere else. That is obviously not the case. When somebody falls seriously ill, he or she is referred to specialist hospitals in metropolises. Thus, the number and the cancer mortality rate paraded with so much fanfare represents nothing at all. But, unashamed at participating in this fraud, nucleocrats go one better. They calculate the mortality rate by dividing from 1967 when the hospital opened rather than from 1973 when the plant opened. As they say in computerese: garbage in; garbage out.

The Burden of Proof

Although villagers have taken the initiative and have gotten a survey carried out, I think it is a shame and a pity that in our country, the burden of proof of injury falls on poor victims of pollution rather than on the polluters. Similar is the case of Bhopal and numerous other places. Unless we can shift this burden from the victim to the pollutr, we would remain an unjust and uncaring society.

Down's Syndrome Higher Near Nuclear Plant

A Canadian federal government study has found puzzlingly high incidence of Down's Syndrome in Pickering and Ajax, two communities near the Pickering nuclear generating station.

The study, done for the Atomic Energy Control Board, tracked congenital abnormalities in a 25 kilometre radius around the nuclear plant from its startup in 1971 to 1988. The study was done by Ken Johnson, head of the birth defects section at Health and Welfare Canada. Mr Johnson is also responsible for the national data base that records birth defects, the Canadian Anomalies Surveillance System.

Although the study concluded that infant mortality and incidences of most types of birth defects are no higher near the plant than the average elsewhere in Ontario, Down's Syndrome rates in Pickering were *86* per cent higher than the provincial average and in Ajax 46 per cent higher. The study was undertaken after widespread media coverage three years ago of a birth-defect study by David McArthur, a York University graduate student, that raised a possible connection between childhood abnormalities and releases of tritium from the Pickering station. (See *Anumukti* Vol.2 No.5 April 1989)

The research on birth defects adds another dimension to the debate over the safety of living near nuclear facilities. In a study released in June by the Atomic Energy of Control Board, (AECB) childhood leukaemia deaths in Pickering were found to be 34 per cent higher than the provincial average, but the researchers concluded the finding might be due to chance.

This is not the only report of a connection between radioactive contamination and Down's Syndrome. Earlier, Dr Patricia Sheehan, a Down's Syndrome specialist from Ireland had shown a similar connection with respect to the fire at the Windscale nuclear facility in England in 1957 (see *Anumukti* vol.1 no.4) Also, the West German Institute for Human Genetics had detected a significant increase of Down's Syndrome in children born in January 1987 in West Berlin following the Chernobyl nuclear disaster in April 1986. There has been a extensive work carried out by Dr Kochupillai and coworkers and later on by the group headed by V.T.Padmanabhan, which has shown a connection between the high backgoround levels of radiation in the monazite bearing sands of coasts of Kerala and Down's Syndrome. However, the Canadian study is the first which links 'harmless' routine releases from nuclear power plants with this condition. It is also the first such study conducted by an official nuclear energy authority anywhere in the world, which admits that a problem exists.

Ontario nuclear power plants routinely release small amounts of tritium. According to a statement issued by AECB, these releases result in a very small radiation doses to the population in the vicinity of the plant. The amount being in fact less than one hundredth the dose received from naturally occurring sources of radiation.

Narora: New Era of Nuclear Irresponsibility

There was a time when nuclear power plants, missile flights, large construction projects and all such fanciful white elephants were "dedicated" to the nation with a ceremony befitting the birth of a son in a royal household. The Prime Minister would do the dedication while the high and mighty would be in attendance. The whole event would be conducted with extravagance. A fling to commemorate the lavish waste of public funds which had been the hallmark of the project in the first place.

Unfortunately, nowadays we live in the age of uncertainty. One doesn't know for sure, that the august personage one invites for the grand event would still be holding his or her exalted office by the time the great day comes around. One doesn't even know for certain that the button that is pressed to signify the start of operations, would not result in an explosion. Being men of the world, nucleocrats have decided that discretion is the better part of valour, and have opted for 'simple' opening functions. The opening of the second unit of Narora Atomic Power Station was announced by Dr P.K.Iyengar, the Chairman of Atomic Energy Commission, at a press conference.

The earthquake of 20th October, which devastated vast areas of Uttarkashi and Chamoli districts of Uttar Pradesh, put a damper on the festivities. It was yet another grim reminder of the fact that this region is geologically unstable and is prone to tremors of moderate to severe intensity. Whether these occuranees become calamities or not depends not, only upon the magnitude of the tremors but also on the architecture and lifestyle of the people inhabiting these areas. Japan and California are also regions of geological instability and yet earthquakes there of similar intensity do not cause as grievious harm. The Japanese in particular have for a long time designed light structures for tbeir dwellings and places of work which do not result in serious injury even in case of collapse. One simple and sensible precaution that any government could easily undertake would be to insure that no structure which could cause widespread devastation in case of failure was ever put up in a region prone to 'natural' calamities.

Politics Predominates

However, to expect sense to prevail over political considerations in India, is to expect the impossible. When the idea of the Narora project was first mooted in 1974, the late Dr A.K.Ganguly, who was one of the members of the site selection committee, strongly objected to the choice. However, more obliging nucleocrats, ever eager to please their political masters, argued that if nuclear power plants were to be excluded from a region on the basis of seismic unsuitability alone, than more than two thirds of the country would become out of bounds for reactor construction. With the change of government in 1977, the Narora project went into cold storage. Although Shri Charan Singh was very keen to have the project approved, he did pay heed to the warnings voiced by technical experts. However, once Smt Indira Gandhi returned to power in 1980, she was especially interested in the project as a means of demonstrating to the farmers of western U.P. her clout by accomplishing a task which even Shri Charan Singh had been unable to do. All technical objections were brushed aside and the project was on its way once again.

Earthquake Proof Design?

Luckily the recent earthquake which measured 6.1 on the Richter scale was not in the near vicinity of Narora. The epicenter was more than two hundred kilometres away. According to Dr S.L.Kati, the Chairman of Nuclear Power Corporation, instruments at the plant site designed to measure ground accelaration, recorded a reading of O.025g. Dr. Kati claims that Narora can withstand tremors even ten times as strong. He has in a letter to newspapers tried to clarify the seismic design concept underlying Narora. He says that "the concept of the plant takes into account two levels of earthquake; one is known as the operatingbasis (0.15g) which is expected to occur once during the lifetime of the plant and at which time the reactor is expected to remain operational. The second level (0.30g)indicates the maximum magnitude at which all safety systems are expected to be fully functional and the reactor shut down safely. The seismic instrumentation at Narora is set to shut down the reactor at a conservatively low level of O.lg. The recent recorded ground acceiaration of 0.025g at Narora is very much lower than this value. Under international procedures and regulatory requirements, the level of ground accelaration that was felt at Narora on October 20, does not call for an automatic reactor shutdown or any special examination of the plant and equipment. No visible damage to structures in the vicinity of Narora was reported and there was no disruption in telecommunications, water supply, electrical and power systems." So far so good! One hopes and prays that the Narora power station never has to undergo an earthquake of an intensity which would severely test all its safety systems. However, the present earthquake does raise certain questions which need to be seriously addressed.

- The assumption that a nuclear reactor has been built to withstand earthquakes of a particular intensity, is based on computer modelling, which has been found defective in the past. For example, in 1979, the U.S. Nuclear Regulatory Commission temporarily closed five nuclear reactors when it discovered that the engineers had underestimated the stresses that piping in the reactors' coolant system might have to withstand in the event of an earthquake. Other nuclear plants, such as the Humboldt Bay reactor in northern California, have been closed after years of operating because they were belatedly found incapable of withstanding a severe earthquake.

- The safety of nuclear reactors also presumes that individual components like piping, valves, electrical circuitry, etc., have been specifically engineered to meet desired seismic specifications. There have been persistent and serious allegations made by Dr Dhirendra Sharma that substandard and counterfeit parts have been widely used in the construction of Narora reactors. Nucleocrats have chosen to just ignore these charges rather than to publically conduct any inquiry into them.

- The 'science' of earthquake prediction is yet in its infancy. Although the design basis earthquake is presumably based on the data gathered over the last hundred years in the region, there is no guarantee that the next earthquake would not exceed in intensity anything previously experienced and hence the value which the engineers have guessed for it. Even in California, geologically the most studied region on earth, there have been earthquakes in places and of magnitudes which have surprised experts as little as two years ago. In fact, a one mile section of a freeway in San Francisco collapsed following an earthquake which measured 7.0 on the Richter scale in October 1989. An earthquake of that magnitude is certainly possible in the Narora region. It is what Dr Kati assures us, that Narora has been built to withstand.

- Of even greater concern than the safety of the reactor containment building are the radioactive waste storage pools situated near the reactor site. The waste stored in these pools can contain more radioactivity than found in the reactors themselves. Since, these pools are designed as temporary stuctures, their construction vis-a-vis seismic criteria is more lax than for the reactors themselves.

- The emergency evacuation plan developed by the nuclear authorities does not even consider the possibility of a nuclear disaster following an earthquake. It assumes that thousands of people can be evacuated quickly and in an orderly manner. Even in the best of times this is unlikely to happen, but just after an earthquake, with damaged roads, overworked and impaired communications systems, loss of electrical power and panic amongst the ranks and also in the populace, it is surely impossible.

- Lastly and most importantly, Narora is located on the banks of the Ganga. The Gangetic plain is the most populous and fertile region of the country. We cannot afford a Chernobyl anywhere, but in Narora it would mean the end of our civilization.

The Great Indian Megawatt Vanishing Trick

For the last many years one has been hearing time and time again that Narora is a standardized design: the forerunner of other reactors of 235 Megawatts capacity each. The advertising blitz launched last year "Nuclear Power and you" also says this and in fact goes on to add capacities of various non-existant plants to show how they would all together contribute 10,000 Megawatts by the year 2000 A.D. However, all the newsreports regarding Dr. Iyengar's press conference opening Narora-2 stated very clearly that its capacity was just 220 Megawatts. This figure of 220 MW was mentioned at four different places in one newsreport. The reports in fact mentioned that the capacity of the previously -opened Narora-1 was also 220 MW. That this figure is not just some inattentive reporter's slip or the ever convenient printer's devil, gets confirmed from a signed article by the Chairman of the Nuclear Power Corporation, Shri S.L.Kati in the *Financial Express* (21st November, '91) which too mentions the same figure of 220 Megawatts. He if anyone ought to know.

This loss of 15 Megawatts is no joke. Since Narora is the standardized design, other reactors now under various stages of construction in different parts of the country would also presumably be of 220 MW capacity. This would mean a total cumulative loss of 120 Megawatts from the nuclear generating capacity. That is more than the capacity of RAPS-1!

Cheapest Nuclear Energy in the World!

Another point to emerge from Dr Iyengar's press confere nce was that Indian nuclear power plants cost roughly $650 per kilowatt to build while the international cost of a nuclear power station is around $2,000 per kilowatt. Capital costs are the main component of costs of nuclear electricity since as the nucleocrats keep telling us the maintainance cost are small—"it takes only a few truckloads of uranium a year to run a nuclear power station instead of a whole trainful of coal every day it takes to run a coal-powered plant." With a cost advantage of almost three times, the Department of Atomic Energy is producing what has to be the cheapest nuclear electricity in l. I wonder re is no de rush of or- ndian exper-tise in nuclear power plant construction. Either no body believes these wonderful figures, or else outsiders are fearf ul of plants that loose 15 Megawatts of capacity at press conferences. Perhaps they look at overall plant performance and decide that however cheap these reactors may look at first sight, they are worthless since they hardly produce a quarter of their capacity, (See Box)

A Nuclear Quiz

The question concerns two Indian reactors. One is a 220 MW reactor which opened in 1973. In 1981, cracks were discovered in its end shield. It was shut down for repairs for three years briefly opened and had to be again shut down. It was called a prototype and was almost written off, but heroic efforts have revived it. However, for safety reasons, it has been derated and is not allowed to operate beyond 90 MW There is also the other reactor. The very latest (before October 24,1991) 235 MW reactor which opened in March 1989. It probably had some initial problems (what are called teething troubles by doting nucleocrats) but these were overcome and it has been in commercial production for more than a year now. Its design is the standard which subsequent reactors in the country would emulate.

Question:

During the year from July '90 to June '91 which of these two reactors produced more electricity?

Answer:

The correct answer is that they were both awful, Narora-1 did produce a little more electricity than RAPS-1, but both together produced less than either of the units at Tarapur. The plant load factor was just 25 %.. In July and August '91 they both did not produce a single unit.

Fire Delays Kakrapar Opening

During the budget session of the parliament, the government had informed the house regarding the imminent opening of unit-1 of the Kakrapar atomic power station. It was said that the unit would become critical latest by December. Some articles eulogising nuclear energy also appeared in Gujarati newspapers. The role of nuclear energy in mitigating the chronic power shortage in Gujarat was stressed. They all greatly praised the heroic work done by the engineers and the construction workers who had managed to complete the construction in just seven years instead of the sixteen that it had taken Narora. As a matter of fact, construction workers had struck work, demanding bonuses for having completed the construction so quickly. The authorities did give in to these demands.

Now it seems that these annoncements and press briefings may have been somewhat premature. As the saying goes, never count your nuclear chickens before they are hatched. A fire broke out in the turbine room during a routine preliminary test. The test was being carried out taking power from the Ukai hydroelectric power station. The engineer on duty ignored warning signals and hence the fire is being attributed to human error. The fire has caused extensive damage to transformers and the whole electrical circuitry in the power station. The authorities were tightlipped regarding whether the fire had caused damage to the control room of unit-1. Visitors to the plant after the fire were shown around all other parts of the reactor, like the calandria etc., but received only excuses when a request to be shown the control room was made. They were told that the "fire had started in a structure in between the turbine room and the transformers. The only structure in this location was the control room. It took more than a week just to restore electricity supply to the station following the fire. The whole area around Kakarapar, including the workers' colony at Moticher remained in darkness all this while. Estimates of monetory damage vary from Rs 4 crore to Rs 36 crores. These numbers are not very relevant, since the interest charges for a few months on the hundreds of crores that Kakrapar has cost would themselves be comparable to these amounts. And there is no doubt at all that this fire has delayed electricity generation from Kakrapar by well over a few months. If one adds to these costs the cost of the lost production in downstream industries because of the delay in the commissioning of the plant, the loss to the nation due to the fire could be well around Rs 100 crores.

Normally one would expect, with losses of such magnitude, that the press in Gujarat would be publishing reports after reports and discussing this incident threadbare. Unfortunately, normal criteria do not apply with sacred cows like nuclear energy. The only report that appeared was a small inconspicuous bit on an inside page of *Gujarat Mitra.* The only 'National' newspaper to publish an account was *The Economic Times,* and it did this almost, a month after the event and most of that report consisted of reassurances from the plant authorities that no nuclear materials were involved in the fire.

This fire has caused great consternation amongst the people living in villages in the vicinity of Kakrapar. They had for long been fed "facts" by nuclear authorities: like accidents in a nuclear power plant are rarer than meteors falling upon houses. Therefore, a major accident even before the formal opening of the plant has been a cause of severe anxiety.

Another issue which is agitating some villagers in the nieghbourhood is that the authorities are in the process of raising the height of the Kakrapar dam. This is being done, because it seems that the water presently available in the dam would not be sufficient to meet the current needs and also simultaneously meet the needs of the nuclear power plant as well. What is still somewhat unclear is whether this realisation has dawned just now or whether this was part of an old plan. It is quite possible that the water requirements of the nuclear power station could never have been mot by the old dam, but the authorities had kept the local people in ignorance of this fact. Quite often one hears "Where were you till now" and "why did you not protest before these hundreds of crores were spent" as criticism of protest actions. All such criticism fails to take into account the nature of the authorities who love to keep the public in the dark regarding their plans till the last possible moment and then plead that the time for protest is long past.

Peringome: People March Ahead

People turned up in large numbers from different parts of Kerala to participate in the march organised by the Peringome Antinuclear Forum. The 70 km march, started from Peringome on 1st of November, 1991 and ended at the collectorate at Kannur on the 4th of November. It demanded from the government that it scrap the proposal to establish a nuclear reactor at Peringome.

The agitation against the Peringome plant started on 26th of April, 1990. On 6th of August, 1991, thousands of people had picketed and paralysed work at five government offices in Peringome. But despite all this, the authorities had remained unconvinced and in no mood to abandon the proposal. They had continued to abandon the proposal. They have instead, gone ahead with the construction of the Kakkadavu dam, which would provide cooling water to the proposed reactor.

The most remarkable feature of the Peringome struggle is the fact that it is not aimed simply at avioding a nuclear reactor at Peringome. The people are not only against siting the plant at Peringome, but they oppose the siting of the plant anywhere else in Kerala, or in India or for that matter anywhere in the world. Thus, although the actions are local and site-specific, the slogans used are global and against nuclearisation everywhere. The campaign has stressed the economic, ecological and ethical questions involved in the nuclear option.

The other remarkable feature of the agitation has been the wide participation cutting across all political barriers and petty sectarian biases which have been so important in Kerala till now. All participants have come voluntarily of their own will and convictions; there have been no party shepards to flock the sheep. Artists, writers, professionals, media people and ordinary folk joined hands in solidarity and made the march a memorable experience.

The march was inaugerated on 1st of November at 11 A.M. by Mr M.T.Vasudevan Nair, an eminent writer and film director. He told the gathering, "We have to say an emphatic NO to nuclear power, not for our own sake, but for the sake of future generations. We have no right to make their lives miserable and unlivable." Shri M.P.Veerendra Kumar, managing director of *Mathrubhoomi,* demanded that the government publish a white paper on its nuclear projects and that the Atomic Energy Act of 1962 be scrapped. Scientists, however clever and intelligent they may be, should not be exclusivly entrusted with the authority of taking decisions involving severe risks. Bishop Dr. Paulose Mar Paulose, champion of liberation theology and a renowned orator in Malyalam, presided over the inaugeral meeting. He pointed out that if democracy has to have any meaning, people should have active participation in the decision making process and it is the people's will that should pervail. The minority decision to impose a nuclear power plant on the people militates against the very spirit of democracy.

Antinuclear friends from outside the state had also come to demonstrate their solidarity with the struggle of the people of Peringome, and their presence added a unique momentum to the entire campaign preceding the march. Dr. Sanghamitra Gadekar of the *Anumukti* group and Shri Rajeev Singh an activist from Network to Oust Nuclear Energy in Delhi, spoke about their experiences at Rawatbhata, Kakrapar and Narora. Dr Sanghamitra said that the people of Kerala are lucky because unlike the people of other states with nuclear power plants, they already have before them the bitter experiences of nuclear energy production.

There were receptions organised by the local people all along the route of the march. Several teams of actors put up street plays at various centres. Some organisations had raised huge banners along the route greeting the marchers. Besides continuous slogan shouting, the marchers enthusiastically sang songs and recited poems. Copies of a Malyalam booklet, *Nuclear Power: False Promises, Horrible Realities,* were distributed all along the march.

Ms Nandini, Ms Asha, Dr C.K.Jagdeesh, A.K.Ramakrishnan, N.Subramanium, T.S.Ravindran, K.Ramachandran, A.Mohan Kumar, T.Ravithran and several other activists explained the potential threat caused by the Peringome plant.

There were three overnight halts during the march. Each evening there were public meetings organised at each of the venues. The first night the halt was at Payyanur, the second at the Taluka headquarters at Thaliparambha and the third night at Puthiyatheru town. People gathered in these meetings in very large numbers. Among the speakers besides those already mentioned were editor of *Ankh* Prof John C Jacob, Sathyam Mokeri M.L.A., veteran freedom fighter Shri A.V. Sreekanta Poduval, K.T.Kunhikannan, Kasturi Devan, Ashraf, Rajeev Kumar and other leaders of organisations.

On the last day of the march, a charter of demands was submitted to the distric collector asking that the government declare in unmistakable terms that the nuclear plant would not be set up. The renowned poetess Sugatha Kumari administered an oath, "In order to guard the future generation's right to live, we shall struggle against the nuclear plant till our breath lasts and till the last drop of blood is within us." Later, a valedictory meeting was held at the Stadium Complex, Kannur. The meeting was presided by Dr T.P.Sukukaran, noted playwrite, educationist and social worker. It was addressed by luminaries like Dr Sukumar Azhikode, Bishop Rev. Sebastian Valloppalli, Sugatha Kumari, K.V.Surendranath D.Vinayachandran, C Unni Raja, and Dr Sanghamitra.

There is no doubt that the march and the campaign has renewed confidence in the people and has made them more determined than ever to resist the atomic menace.

K. Ramachandran
Peringome Antinuclear Forum
Payyanur 670 307
Kerala

Antinuclear Forums

An Antinuclear forum was formed at Thrissur on Nov2, 1991 under the chairmanship of Prof K.Satchidanandan, poet and critic. Mr P.K.Venugopalan is the convenor.

The forum shall educate people at the grass-roots level, so that a new perspective of development can be achieved. As part of this programme an antinuclear training camp shall be held in February to train activists.

Till now, 12 antinuclear forums have been formed at panchayat level. Work is going on to form units in other panchayats of the district.

LETTER BOX

What are the other nations of the world doing and thinking with respect to the producton of nuclear power? Recently in The Times of India, there was an article on the son of Field Marshal Romel, who is now the mayor of Stutgart. The article says that this German town has two nuclear plants; I have read in *Anumukti* that the most recent tendency in the developed countries is to frown upon and discourage new nuclear plants, because of the dangers of radiation and because of the problems associated with the disposal of radioactive wastes. I think it would be worthwhile to publish a survey of the nuclear plants already established in developed countries of Europe and North America and in Japan. Japan would be of particular interest since it is known that it has no sources of coal and oil.

All our nuclear plants like Kaiga are situated far away from inhabited areas, but the Stutgart report shows that the plant there is situated close to the city. Can *Anumukti* organise a conference in

India of the representatives of these countries for a discussion on this subject? In a world of progressively depleting fossil fuel resources, the importance of the subject of peaceful utilisation of nuclear energy should be obvious.

I would also like to draw your attention to the letter published in *The Times of India* of 24th September, 1991, under the title "RAPS Safety", bearing the signature of Dr K.S.Parthasarathy, Secretary, Atomic Energy Regulatory Board. On a similar complaint published in *Anumukti* last year by Sanghamitra Gadekar, I had sent an enquiry to the Atomic Energy Commission in New Delhi. That enquiry has elicited no reply uptil now.

Shri R.K.Patil
Civil Lines
Nagpur

Editor's Reply:

No new nuclear plants have been ordered in the western part of the presently united Germany for more than fifteen years. Nobody, not even the Indian nucleocrats is advocating that new nuclear plants be built near the cities due to the risk involved in a catastrophic accident. Thus, the fact that there are old nuclear plants not too far away from some cities in Western countries in indicative not of the safety of nuclear energy but rather of the ignorance and arrogance of nucear establishments of these nations in days past.

Not all our nuclear plants are situated far away from densely inhabited areas. The latest addition to the nuclear family, Narora, is situated right in the midst of the most populous and fertile regions of the country. Even where nuclear plants have opened in sparsely populated regions, like Rawatbhata, over the years, people from other parts migrate to the region to provide services to the workers' colony. In a few years the area no longer remains uninhabited.

A nuclear industry journal, *Nuclear Engineering International*, does publish country wide surveys of nuclear establishments in various parts of the world. This journal is available in libraries of some engineerng colleges and might be awailable with the National Institute for Research in Environmental Engineering in Nagpur.

As far as your proposal for a conference on the peaceful uses of atomic energy is concerned, I don't see any merit in it, even if *Anumukti* had the capacity to organise such an event.

In a world of depleting resources, the future lies not in persuing fossilizing technologies, but in using less, wasting nothing and working towards self-sustainable technologies and lifestyle.

* * *

I was pleased to read about your bi-monthly journal on non-nuclear India, in the July/August issue of *Good Life*. I am a perma-culturist. Permaculture advocates the planning and design of totally self-sustainable, independent systems which generate all the five F's (food, fodder, fuel, fertilizer and fibre) within the system by employing common-sense, environment friendly technology. In energy generation, pefmaculture advocates conservation and waste recycling.

But more importantly, I am a natural hygienist-I and my family are enjoying the benefits of a drugless life for the last four years. We have slowly moved away from a lot of artificial things and are now planning to settle down on a farm of our own. I am therefore a staunch opponent of the nuclear power (for whatever purpose) lobby.

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Subscription Rotes:

Rs. 25/- per year South Asia
U.S.$15/- per year or equivalent in other convertible currencies (airmail overseas)
(Rs.300/- per year if paid for in India)
Rs.250/- for life (only within India)
Please add Rs.6/- for cheques
Drafts should be drawn on State Bank of India, Valod (0531)

Editor: Surendra Gadekar

Subscriptions, donations, manuscripts, inquiries regarding circulation, etc. should all be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist:Surat, 394641 INDIA

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printry, Ahemedabad

PRINTED MATTER **BOOK POST**

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 5 Number 3 December 1991/January 1992

Where the clear stream of reason has not lost its way in the
dreary desert sand of dead habit;
Into that heaven of freedom, my Father, let my country' awake.

Rabindranath Tagore

Anumukti Cycle Yatra

Nuclear power as an idea that can change the world has long been dead. There are no visionaries like Homi Bhabha or Vikram Sarabhai around: people who believed in what they were doing; who saw atomic energy as an instrument that would lead us out of poverty, ignorance and disease—that would lead to a tetter tommorow. Today, for most within the establishment, it is just a job. The stream of reason has indeed lost its way into the sands of habit.

Chernobyl did not kill nuclear power. It is a symptom of death rather than a cause. What killed the nuclear idea, is the fact that whatever power it does deliver, (and compared to its tall claims, it produces peanuts), it delivers to too few hands. Power corrupts. In a world striving for freedom and democracy, the dead weight of this corrupting source is too much for any society to carry.

But then, why is *Anumukti* flogging a dead horse? Why not let it fell down of its own contradictions? The reason is that though the idea is dead, the habit is not. Thus, we have the Indian nuclear establishment blithely continuing its disastrous course. Instead of taking the golden opportunity provided by the Soviet withdrawal from Koodankulam for some introspection and rethinking, we have them all set to build there the as yet undesigned 500 MW CANDUs. Despite the mounting evidence of unacceptable health effects, we have them propose a new nuclear plant in the densely populated state of Kerala. Truly, it is difficult for those who have once tasted power, to give up that power and the associated perks without a fight. And people will be ready and willing to fight only when they understand the issues throughly.

It is for this reason that *Anumukti* and the Sampoorna Kranti Vidyalaya propose to embark on a cycle yatra from Kakrapar to Peringome to raise people's awareness of the perils of nuclear power generation and to bring to their notice the latest horrific information about the health effects being suffered by the people living in villages around Rawatbhata. But the purpose of the yatra is not just to warn the people against the nuclear dangers but also to form close links with various people who are the victims of 'development', so that an alternative model of real development can emerge.

The cycle march would begin around the 20th of March from Vedchhi and proceed via Vansda and Valsad to Tarapur and from there on to Bombay. From Bombay it would go down the coastal highway to Goa, into Uttar Kannada near Kaiga and from thereon to Manglore, reaching Peringome around the 24th of April. The dates are still tentative and a final timetable will be decided after all the arrangements are complete. This route would bring us in proximity of many existing and proposed nuclear installations Kakrapar, Tarapur, BARC at

Chembur-Bombay, Jaitapur, Kaiga and Peringome. One of the purposes of the yatra is to form close links of friendship amongst people who are all suffering or are being threatened by the nuclear menace.

Obviously, the yatra would not succeed in its objectives unless it was able to draw upon the willing cooperation of large number of different activist groups along the route and elsewhere. We want you to join the yatra. You can do this in various ways:

- Coming yourself or sending some person to join the group of cyclists for the whole distance or some previously defined parts thereof
- Sponsoring a cycle or making monetory contributions towards the cost of the yatra
- Arranging for the stay and boarding of the yatra at destinations along the way
- Translating and publishing written material about the yatra and about nuclear power
- Help in arranging public meetings and slide-shows, press conferences and meetings with local media personalities

There is a proposal to limit the number of volunteer yatrees to twenty, since otherwise it may become too big and perhaps an unwelcome burden on the local hosts. We would like to invite participants from all over the country and especially from the states which lie on the route of the yatra to join in for the whole duration. Therefore, all those who might be interested in joining the march should write to us at Vedchhi as early as possible.

The antinuclear forum at Peringome plans to hold a convention to commemorate Chernobyl Day on April 26 and the yatra would conclude there.

The yatra would need a lot of preparatory work. This would involve not only establishing contact with groups and individuals on the way but also

- Design and preparation of a transportable poster exhibition in all the local languages
- Preparation and printing of pamphlets and written materials explaining the menace of nuclear energy and the purposes and the programme of the yatra in all the local languages.
- Preparation of songs, a drama and some short skits and street plays depicting the threat of nuclear energy

To do justice to all this we will be holding a ten day preparatory camp at Vedchhi starting on 10th of March, 1992. All those who can donate their talent and time during this period, are most welcome to come to Vedchhi.

Most of all, we would like *Anumukti* readers to join us by making this yatra your own, keeping in touch and by letting us know what all we ought to do to make this a success and by suggesting names of contact persons along the route whom you might know and we don't but ought to.

From The Editor's Desk

"Anumukti has lost its balance," a regular reader, Girish Sant from Pune recently told me. "It is just full of accounts regarding the health effects of radiation but it does not carry anything on energy planning and alternatives." Unfortunately, there is a lot of merit in this criticism. *Anumukti* does need to present a comprehensive view, and there are many facets to the nuclear question. The problem of health effects has dominated most recent issues of *Anumukti*, because I think that it is only the irrefutable and mounting evidence of unacceptable health effects that would put a final finish to the nuclear madness. I have sometimes tried to get around this problem of comprehensive coverage by having separate numbers highlighting a specific issue each time, and in fact, Vol.2 No.4 did deal at length with the issue of energy planning and conservation. However, this arrangement is not very satisfactory since it actually is an arrangement which makes for an 'unbalanced' *Anumukti* every time. I would like to hear more (or more accurately in most cases, hear for the first time) from you regarding your views on how to adequately tackle this problem of balance.

An article which might surprise regular readers of *Anumukti* is the announcement, SUN DAY 1992: A Campaign for a Sustainable Energy Future. At first sight this campaign seems to be a purely American programme, having nothing much to do with us. It has been included in such detail because I feel that we urgently need something similar—a strong citizen initiative to highlight the true nature of our energy and environment crises so that an attempt can be made towards solution. These problems are too vital to be left for the political leadership to blunder along

One individual initiative which we plan to carry out in full earnest is the Anumukti Cycle yatra from Vedchhi to Peringome in Kerala. We plan to reach Peringome in time to commemorate Chernobyl Day on 26th April. The antinuclear movement against the proposed Peringome nuclear power plant is going to hold a convention and they want groups from all over the country to come there to express solidarity. If other groups especially from the southern states could also come to Peringome in large numbers simultaneously it would be a very fine expression of people's will.

CANDU Won't Do

CANDU nuclear reactors are inherently unsafe. Their operating record in Canada shows that they present a serious risk of a major accident. This is the conclusion of a Greenpeace review that examined the operating records of three CANDU stations in Ontario province of Canada from 1989-1991: Pickering, Bruce and Darlington. Authored by Stan Gray, study found incidents that could have triggered a meltdown scenario. It also found that the safety systems that would protect against this were impaired and unavailable a good part of the time.

The study looked at the record from the years 1989 and 1990, and the available records from 1991. These records are on file at the Toronto head office of Ontario Hydro. (The utility company which owns and operates all the nuclear reactors in Ontario.) One should note that this Greenpeace report is based on facts as reported by senior Ontario Hydro management in public documents. As a result it probably errs on the side of underestimating rather than overestimating the risks and dangers. One can reasonably assume that officials tend to underreport or downplay incidents that might put the public safety in jeopardy because they want to reassure a concerned public.

The facts outlined in the study indicate that

- 1. A major accident is possible
- 2. In the past, the CANDU reactors have sometimes come very close to such a scenario
- 3. These problems will continue into the future

An Appaling Record of Unavailability

Shut Down Systems

The two shut down systems used in CANDUs need to be extremely fast acting and automatic since an emergency may develop in seconds, too quickly for operators to respond in time.

Since the reactors came on service, there have been numerous emergency shut-downs—some necessary and other "spurious" or accidental ones. To Ontario Hydro management this is proof that the system works - major accidents were avoided by the shut-off mechanisms. This history is, however, double-edged in its implications. A large number of shut-downs means that there were a large number of situations calling for emergency response. The implication is that should the shut-off system not function when called for, we would indeed be in a serious trouble.

The fact is that the shut-down systems have been often impaired and unavailable. Should an emergency develop at a time when the systems are unavailable, the automatic shut-down won't kick in. At that point we might edge right into a major nuclear accident.

The Significant Event Reports (SER) filed by Ontario Hydro detail many incidents at all stations over the last two years. At Bruce B for example, it was found out that the safety systems at some units would not shut the reactor down when the fission became abnormally high ("neutron overpower"). Investigation showed that the systems would only respond to a higher than designed level and that this condition had existed for 8 months in one unit and 17 months in another.

Emergency Cooling System

Should the core begin to overheat, the Emergency Cooling Injection system (ECI) is supposed to kick in and flood the core with cooling water. The problem here is that the system is often not triggered on time and may not work when triggered.

An examination of these ECI systems by the official Nuclear Integrity Review Committee found that the licensing safety requirements were violated on a frequent basis. In 1990, for example the ECI was unavailable 146 times in excess of the safety margin at Pickering A. Bruce A exceeded its margin by a factor of 331.6 in 1989.

Containment

The nuclear industry has touted the CANDU containment system as the public's last line of defence against a nuclear accident. It is supposedly a fool proof system. Had the Chernobyl reactors had a containment building, we have been told, that tragedy would have been averted.

The record for 1990, prepared by the officially appointed Nuclear Integrity Review Committoe, shows both Pickering and Bruce stations grossly exceeded (by factors ranging from 43 times to 341 times) the licensing safety margins for availability of containment. All of this represents an appalling level of malfunction in the basic safety system of the reactors. Put very simply, for much of the time, the publics safety net has not been there. It is therefore, misleading for senior Ontario Hydro officials to repeatedly refer the public to the containment protection when their own reports indicate that it is defective for substantial periods of time.

The nuclear authorities have continually told a worried Canadian public that a Chernobyl-type accident couldn't happen in Canada. Their soothing reassuarances have been based upon the supposedly superior safety design of the CANDU reactors/The operating record, however, shows that the system has never functioned according to the ideal model described by industry spokespersons. The public statements have not matched the information contained in their own technical reports. Their description of the nuclear plant operations have been more fantasy than fact.

The record shows that the accident risks stem both from design faults as well as from equipment failures. The documented record of flaws, breakdowns and unavailability is staggering. (See Box page 3.)

Loss of Electrical Power

Electrical power is the key to all the systems in the generating stations. Loss of power means loss of control. It is for this reason that CANDU stations have a number of redundant electrical systems, standby generators, and emergency power supplies that can kick in if a major failure occurs.

On September 16,1990, the main output transformer at the Darlington nuclear power station exploded, spilling 59,000 litres of oil. This was the second such main output transformer explosion at the Darlington station in two years. The explosion led to the loss of operating power to the plant (so-called "Class IV Power"). The electrical systems are built so that if the main transformer blows, operating power to the plant will be automatically switched to other sources. However, the Significant Event Report states that the connectors that would provide this supply happened to be de-energized at the time...with the consequent loss of Class IV power, an unanticipated event. The report states that Class IV power was eventually restored, with no unit shutdown indicated. However, this was an accident that should not have happened at all! All this is more worrisome when we look at how often the various emergency power systems were unavailable. A month after the explosion, for example, a routine inspection at Darlington found that Standby Generator #1 could not be safely run. At Pickering, there are twelve reports of standby generators failing to start during the period 1989-91. There are also reports of other emergency power systems failing as well as several instances where the whole station lost its required safety margins with its electrical systems.

Pickering-2
September 26,1990

"... the potential for flux oscillations is a fundamental, albeit undesirable, characteristic of CALNDU reactors, which must be addressed both in the design phase and during operation." Ontario Hydro Report Feb. 1991)

On September 26, 1990, unit 2 at Pickering experienced a severe runaway fission reaction. Parts of the reactor core began to act independently and went out of control, fissioning at a rate beyond acceptable limits. The patterns were erratic and unexpected. The operators were u liable to bring the fission under control for about 50 hours. During this time more than 11,000 alarm messages were received. (This is referred to as a 'severe flux tilt' or 'flux oscillation'. The term 'flux' is an indication of the density of free neutrons in the core.)

A number of alarming things happened during this major loss of regulation accident. Fission ought to be dampened by the use of coolants in various sectors of the reactor core ("liquid zone control"). However, these proved ineffective at the time. Unable to control runaway fission for several shifts, the unit was manually shut down.

The subsequent high-level investigation revealed that this problem was endemic to CANDU reactors. The malfunction was inherent in the system's basic design: no adequate methods were available to identify or control such severe flux tilts. The reason for this flaw lies in the fact that with a large core, geographical segments of the core start acting independently of each

"Hot Particles: Danger to Worker's Health

Workers have complained for years about excess exposure to radiation inside CANDU nuclear plants. The event reports document instances of spills, leakages and other hazards from radioactive materials. In March of 1990, workers walked off the job at Pickering to protest Ontario Hydro's inadequate monitoring of radiation exposure. They said that they had been complaining about the problem for fourteen years.

One of the biggest concern of workers has been regarding excess radiation from so-called "hot particles". These consists of tiny specs of spent uranium fuel or cobalt-60 particles which have escaped from holes in the fuel cladding, or from fuel debris released from damaged fuel bundles.

Ontario Hydro has acknowledged and documented the problem several years ago at the Bruce plant. The source of these leakages is the fuelling machine that loads the uranium bundles into the core. This is significant, because "on-line" fuelling machines are an unique feature of the CANDU reactor. According to a management memo *"Hot particles are found in the heat transport system and the primary method of these particles escaping out of the heat transport system is through the fuelling machine."*

other like a number of small cores. In some cases, segments may develop runaway fission reactions of their own. The system has no way to either avoid these runaway reactions or of controling them subsequently. Its "spatial" or "zone control" is fundamentally flawed. The Nuclear Integrity Review Committee viewed this incident as an especially serious one. It listed the main causes for the event as:

- A lack of operating procedures for the identification and handling of severe flux tilts

- Insufficient emphasis on the importance of conservative decision-making

- An incomplete transfer of experience from previous similar events

- Impaired spatial control capabilities of he reactor regulating system...

Another of the alarming things that happened during this flux tilt was the breakdown of devices used to measure the rate of nuclear fission - the flux detectors. These began to produce very high readings indicating excessive fission. However, one of the computerized control system that used them was discarded either because the station operators believed the readings were erroneous or because they had to disregard the high level alarms in order to try and bring the runaway fission under control. But once that happened, the operators lacked reliable monitors indicating the fission activity in the reactor core. The situation can be compared to driving on a highway with the windshield blacked out.

The flux-detectors are a key part of the emergency shut-down mechanisms. Yet when many of them gave critically high readings and alarmed, automatic shutdown did not occur. It is unclear exactly what happened here—was the shut down system ineffective in reading and responding to major fission overpower? Or, was the safety system somehow overridden and rendered ineffective, and if so, how? There are many possible answers to this, none of which can give the public any confidence in the safety protection of the CANDU system.

What About the Indian CANDUs?

The operating record of Indian CANDUs is much worse than that of the reactors in Canada. In fact the operating record of the Canadian reactors has been held up as an ideal by Indian nucleocrats.

On an average Rajasthan Unit-l—the "prototype"Indian CANDU—has been down 233 days a year. Of these around 150 days have been due to equipment related failure.

Rajasthan Unit-2,—the most productive Indian CANDU—has been down 106 days a year of which some 65 days have been due to equipment failures.

History of Problems

We can get a better perspective on these events and the dangers they present when we look at other incidents, The sad fact is that such runaway reactions have constantly occurred at CANDU stations and present station managers with endemic problems. In the early years, the Pickering station experienced frequent loss of regulation accidents. In fact, during its first four years the plant had six such accidents. Subsequent design modificatons have not been able to solve the problem as recent events indicate.

Even prior to the September 1900 events at Pickering-2, a similar flux tilt was experienced at Unit-1, Pickering on February 15, 1989. Although, the Atomic Energy Control Board (AECB), Canada and Ontario Hydro officials reassured the public regarding the September incident at Pickering, there have been two similar incidents subsequently on November 22nd 1990 and on January 10, 1991 at the same station.

Gauges that don't work and regulators that don't care

The AECB is charged with the responsibility of regulating the nuclear industry in Canada. It has been frequently criticized for being too close to the industry, apologizing for it rather than regulating it.

Michael Abbot was a technologist with Reuter-Stokes in Cambridge, Ontario, the firm that manufactured the flux detectors. In 1986 he reported that the company was passing on defective? detectors, ones that had failed the tests. He said that test reports were rewritten to omit the fact of failure When Abbot reported his concerns to the company, he was told to forget about the matter. After much introspection, he wrote to AECB and Ontario Hydro, giving details of the falsified test reports No official of either of these bodies ever spoke to Abbot. They checked with the manufacturer and accepted their word at face value. Abbot was subsequently harassed by the company and forced to leave his job. It is only now, after the incidents at Pickering and elsewhere that AECB has admitted to the press the validity of Abbot's charge. And, as a consequence, Ontario Hydro recently "made a decision to replace all the flux detectors rather than wait for a rash of failures."

Conclusions

The CANDU reactors pose unacceptable risks. Greenpeace believes they should be phased out as soon as possible. An immediate ban on future nuclear expansion should be declared and existing reactors should be taken out of service and the money saved should be used to phase in safer methods of generating electricity and to create alternative economic development.

How USSR Squanders Its Energy Reserves

article was written at a time when USSR was still a political entity. However, its observations and conclusions still hold true. In fact, one could replace the word USSR with India in the article and the whole thesis would still be valid!

One of the most urgent priorities talked about in the Soviet Union is how to increase energy production. The hope is that big Western companies will rush in to drill holes and build gas pipelines, thus enabling the USSR to "exchange" its raw materials for modern technology that will help "reconstruct" the country.

True, the Soviet energy system is in a bad way. There are serious shortages in some sectors, like coal, and the country cannot do without the hard currency it derives almost entirely from its energy exports. Energy production and transmission certainly need to be modernised, but it is more urgent to overhaul the corruption system, without doubt one of the most wasteful in the world. More efficient energy use is vital in so many areas that there can be no economic recovery without it. If encouraged with unwavering political determination, however, it will have a decisive bearing on modernisation, higher living standards, increased productivity and repair of the environment.

The most striking feature of the Soviet energy system is the diversity of its production and the size of its resources: the USSR is the world's biggest producer of oil and natural gas, and the third biggest producer of coal. Its oil reserves represent 8 percent of world reserves, its gas reserves, 40 percent, and its coal reserves, almost 30 percent.

The USSR is a net energy exporter: exports are the equivalent of 19 percent of total consumption. The US imports 18 percent of its energy, and the EC, 51 percent. There is an abundance and apparent superiority, but there is also economic vulnerability.

Energy use per inhabitant varies greatly: the US figure of 7.7 TOE (Tons of Oil Equivalent) is more than twice that of EC (3.4 TOE), with the USSR in between (4.9 TOE). But this consumption pattern does not take into account differences in economic levels, as can be seen from the figures for energy intensity (energy consumption relative to the GDP): per $1,000 of GDP, the USSR uses two and a half times as much energy (0.89 TOE) as the EC (0.35 TOE) and the US one and half times as much (0.53 TOE)

Some of the discrepancy can be explained by the much harsher climates and huge distances that both the US and USSR have to contend with. But it mostly arises from their less efficient use of energy at consumer level which is due to the plethora of resources they enjoy compared with the EC, and to a production oriented ideology that has dominated, both systems.

Soviet Relief

Five years ago many Soviet citizens thought they were donating their roubles to an "aid fund for Chernobyl victims". This year, when the Soviet government's state commission for extraordinary situations released a detailed report on its total expenses since the Chernobyl accident, they learned that the government had spent 425 million roubles to reloctate evacuees, 5.8 million roubles to purchase contaminated meat, and even 1.5 million to entertain foreign scientists. But the best was that the figures also included 66 million roubles to cover the general expenses of the ministry of nuclear energy, which, were paid from the Soviet public's contributions.

Priority has always been given to increased output at the expense of steps to improve energy efficiency. Hunger for profit and hunger for power have converged, in the short term at least, in an unbridled exploitation of natural resources.

The limitations of Europe's energy resources have forced it to be more energy efficient than the US and USSR. This gives its economy an overall competative edge, thus turning a handicap into an asset. The EC has also expanded its energy production facilities prudently. Only in France have successive governments, obsessed with notions of grandeur, overreached themselves with a massive nuclear energy programme.

The situation in the US did, however, change significantly after the first oil shock and the country's increased dependence on oil imports. Between 1974 and 1988 energy use per habitant more or less steadied as a result of greater energy efficiency. Energy intensity fell appreciable over the same period. In the USSR, despite official talk of energy-saving programmes, that intensity has risen relentlessly in the last decade.

Energy use is disastrously inefficient in every sector of activity, and nowhere more so than in urban heating, which gobbles up energy and results in colossal wastage. If you stay at a Moscow hotel in January, you have to keep the window of your room open all night because the temperature inside is 30+°C—and there is no regulation system. The route taken by the pipes of the urban heating network is betrayed by lines of melted snow on the pavements.

Because of its inability to control energy production and, above all, consumption, the USSR paradoxically faces very serious problems despite sitting on gigantic resources. The production-oriented dogma characteristic of Soviet economic history is still rife in official circles, even if it has been considerabley watered down by economic and especially ecological constraints.

The country lavishes 40 percent of its productive investment on the energy sector. At the same time, it is having to spend large sums on modernising industry and improving living standards. There is much scope for energy saving, both in existing installations requiring renovation (building insulation, heating regulation, industrial conversion and modernisation) and in new equipment, housing, transport systems, household appliances and so on

Soviet experts believe that if appropriate steps are taken they can reasonably expect to save about 2S0 million TOE over the next ton years. That may seem a lot, but it should be remembered that France, whose primary enegy consumption is now about 200 million TOE, or seven times less than that of USSR, achieved annual savings of 40 million TOE between 1071 and 1089.

Energy savings has already been the subject of important decisions by Soviet leaders. But even they admit that results have been disappointing: the USSR's energy intensity has risen steadily. Free marketeers believe that the main if not the sole, reason for that failure is extremely low energy pricing, which does not reflect production costs. Energy products are regarded as indispensable staple commodities and are therefore subsidised. So there has been no incentive at any level to save energy.

There will have to be a slow process of increased tariffs that goes hand in hand with the modernisation of the production system. The consumer can reasonably be expected to pay for the real cost of energy only when obsolete and leaking urban heating systems have been renovated. In other words, energy saving programmes should be implemented before the notion of realistic pricing is introduced.

The main problem is a centralised decision-making system that precludes any initiative or responsibility. The central planning agency decided on an energy-saving programme that specified the rate at which each ministry and enterprise was to reduce its energy consumption. Meanwhile the industrial production agency was given the task of ensuring that equipment would be manufactured that would make such targets feasible. But it was not given the proper resources to do so, since priority was still being given to energy production.

The system soon seized up: consumers found excuses for not respecting their targets, some of them justifiable, such as the fact that no energy-saving equipment was available. But the biggest obstacle was that no one saw rational energy use as a priority.

Energy saving is just one example, albeit a very important one, of the USSR's difficulty in changing the way it runs its economy. The right solution will not be found in the mirage of privatisation or realistic pricing which is overenthusiastically peddled by Westerners—and now all the rage in Eastern European countries—nor even in the more general principles of a market economy. A successful process of change will hinge above all on the decentralisation of decisions, responsibilities, resources and programme implementation.

Recent political developments suggest that this decentralisation will have to take place at the level of the various republics. As for the Russian republic, it will almost certainly pull through the crisis only if it abandons the illusion that it can organise everything from Moscow.

Bernard Laponche
Le Monde
From Guardian Weekly
December 8. 1991

Editor's Note:
The dissolution of USSR and the rapid political and economic changes being put through in that region of the world has not invalidated any of the points being put forward by the author. But more interestingly, in fact, vitally for us, his arguments are of even greater validity when applied to India, since our energy wastage is greater, we are no less enamoured of the magic wand of privatisation and foreign capital and to top it we have far less resources than what were available USSR.

Koodankulam Gets a Reprieve

The Soviet-aided nuclear power project at Koodankulam in Tamil Nadu has been scrapped, according to a spokesperson of the Nuclear Power Corporation (NPC).

'The project stands cancelled and the NPC has already disbanded its staff assigned to the project, "hesaid. Under an agreement with India, the earstwhile USSR had offered to build a 2,000 MW nuclear power station. It had also agreed to provide a Rs 5,000 crore loan for the project. The NPC spokesperson said that there had been no communication from the present authorities in Moscow, but "we have indications that the project is off."

Except for site preparation and foundation studies, NPC had not done any major work at Koodankulam and India had not paid the Rs 100 crore to the Soviets for the preparation of the detailed project report, he said. According to the spokesperson, the Koodankulam site will not be abandoned. The NPC has sought the government's permission for setting up two 500 MW reactors of Indian design in the same place.

Indian Express January 20,1992

SUN DAY 1992
A Campaign for a Sustainable Energy Future

A growing number (already more than 300) of U.S. national and local environmental, consumer, student, government, business and other organisations are joining together to sponsor a coordinated campaign to promote improved energy efficiency and revewable energy technologies as solutions to global warming, energy imports, radioactive waste, and other local and national environmental pollution problems. This campaign is being called Sun Day 1992: A campaign for a sustainable energy future.

The campaign will include a national day (Earth Day - April 22, 1992) to focus attention, particularly of the media and government officials, on these issues. But it is not being planned as a one day, one-shot event. It is rather an attempt to encourage, launch and support on-going educational, political and other activities. It will serve as an umbrella for many diverse but uncoordinated local efforts so that their impact should bo greater than the sum of multiple individual efforts.

Need

Global warming threatens worldwide environmental disruption; already six of the hottest years on record occured during the 1980s and 1990 was the warmest year ever recorded. Yet national policy makers remain indecisive amidst this pending global catastrophe. Other energy related problems, such as the build-up of radioactive wastes, acid rain, oil spills, and urban smog continue to worsen.

Ironically, there have been both tremendous advances in renewable energy technologies likesolar, wind, geothermal, biomass, and hydroelectric and in the efficient use of energy during the past decade, coupled with dramatic reductions in the cost of these technologies. Today, energy efficiency improvements have saved more energy and renewables are producing more energy every year than nuclear power and "clean coal" combined.

Moreover, many improved energy efficiency and renewable energy technologies could reduce CO2 emissions by at least 25% over the next two decades. These technologies are inexpensive, quick to implement, and environmentally safe options for reducing CO2 emissions. These technologies are also sensible solutions to other adverse envirnomental and economic impacts of conventional energy supplies.

Nevertheless, it now seems increasingly likely that U.S.Congress will approve either weak supportive legislation in 1992 or none at all. It may even approve legislation that actually worsens the damage to the environment, consumers and taxpayers. It is virtually certain that there will be no significant initiatives from the White House to promote these sensible solutions.

Even the national media, while reporting aggressively on the so-called "revival" of nuclear power and the development of so-called "clean-coal", have generally failed to cover the technical breakthroughs, price drops and energy contributions of improvements in energy efficiency and emerging renewable technologies.

In the absence of national leadership, there is a growing number of local and state initiatives to promote progressive energy policies. These efforts are largely uncoordinated; inadequate communication among policy makers and others has led to much duplication, as well as a sense among individual activists that they are "out there", all alone.

Moreover, there is a great reservoir of untapped energy among grassroots citizen groups, local and state government officials, rural organisations, students, religious groups, unions, businesses, and individuals who are searching for opportunities to promote an energy program based on efficiency and renewables. However, in many cases, would-be activists lack information, resource contacts and policy ideas needed to translate their potential energy into action.

Notwithstanding the advances made by renewables and efficiency during the past decade, their gains have largely constituted a "quite revolution". That is, most members of the general public as well as media and key decision makers remain unaware of their current contribution to the nation's energy supply, cost and near term potential. Despite their advantages, these safe-energy options continue to be dismissed as alternatives to nuclear power, increased oil exploration or coal based energy technologies.

Structure and Programmes

SUN DAY 1992 will be modelled on, and borrow from, both the original SUN DAY (May 3, 1978) and the 1990 Earth Day. Earth Day (April 22,1990) was very successful in generating media attention for weeks prior to the actual day and resulted in positive changes in consumer buying habits and business perceptions of environmental issues. The original Sun Day on the other hand, was more of a launching pad for a sustained effort at the local, state and federal levels to promote renewable energy technologies. The movement it helped found remained active and effective for several years. However, both that Sun Day and Earth Day 1990 were, to large degrees, centrally planned and operated on a top-down basis. Both relied heavily on large budgets and corporate or governmental fianancing which, in some cases, may have compromised their initial objectives.

SUN DAY 1992 will include an aggressive media outreach effort

Statement of Principles and Goals

Global climate change, oil spills, air pollution, acid rain, radioactive emissions and waste, rising oil imports, and other energy-related environmental and economic problems continue to worsen, threatening major worldwide impacts. The nation's energy strategy must, therefore, begin now to shape and manage a transition to a sustainable energy future that assures a safe, clean, affordable, adequate, and independent energy supply.

National surveys confirm that the American people overwhelmingly believe that such a strategy should be based primarily on efficient energy use and renewable energy s upplies, rather than on conventional fossil fuel and nuclear power energy sources. However, national energy policy makers have thus far failed to implement such a strategy. From this failure comes the need for a national grassroots campaign for an energy policy that embodies the following principles.

First, the United States must give priority to those energy options that maximize benefits such as environmental protection, local economic development, regional self-sufficiency, and job creation, while minimizing economic, environmental and social costs.

Second, the United States must avoid energy technologies that are particularly hazardous to human health or to the local and global environment.

Third, the United States must minimize the use of energy imports in order to avoid economic disruptions and protect national security and the economy.

Consistent with these principles, tha nation's energy policy should be based on improving energy efficiency, conservingenergy, and developing clean, renewable energy sources through local, state, and national initiatives. To facilitate the transition to a sustainable energy future, U.S. energy policy should strive to implement, at the minimum, the followinggoals, while recognizing that more aggressive targets are achievable and may ultimately prove to be necessary.

- National energy intensity (i.e. energy use per unit of Gross National Product) should be reduced by 3 percent per year, while total energy consumption should be reduced by 10 percent from today's levels by the year 2010. This can be accomplished through the implementation of existing energy-efficient technologies, energy efficient motors and appliances, high - output low-wattage lighting, and more fuel efficient vehicles and alternative modes of transportation (e.g. mass transit, bicycles), as well as through recycling and common sense energy conservation measures. (Such measures reduced projected energy demand by at least 25 percent between 1973 and 1986.)

- The environmentally responsible use of existing direct solar (e.g. photovoltaies, solar thermal, hot water and space heating), wind, hydroelectric, solar-hydrogen, biomass (e.g. wood, agricultural wastes, sewage, alcohol fuels), geot hermal, and other renewal bo energy technologies in both centralized and small-scale appplications should, in total, be tripled by the ear 2010, so that they provide 25-30 percent of the U.S.'s energy supply. (These technologies now account for 8 percent of energy consumption and 13 percent of electricity generation.)

Realizing the above goals would enable the United States to reduce emissions of carbon-di-oxide, the primary global-warming gas, by at least 20-25 percent by the year 2010. (Other industrialized nations such as Germany, Austria, New Zealand, Denmark, and Australia have already set goals of 20-25 percent reductions in CO_2 emissions by the year 2005.)

to help focus the attention of the general public and decision makers on the status and potential of renewable energy technologies and energy efficiency improvemnts. These will include frequent news releases, press conferences and radio and TV talk shows. However, the campaign has been designed to be more than just a one day event. Hence it will include:

- Working with participating groups to survey the energy views of and to solicit support from candidates for elective office in 1992 at all levels of government.

- Associating with local, national and international conferences on energy, environmental protection, economic development and global warming issues already planned for the months following April 22, 1992, such as the United Nations Conference on Environment and Development.

- Provide information on model programmes to public officials and others to facilitate legislative and administrative initialives that advance the SUN DAY 1992's goals.

- Prepare and distribute materials to teachers, students, the media, activists and others in addition to sponsoring ongoing educational programmes in schools and colleges as well as among environmental, labour, business and other communities

SUN DAY 1992 will have a national information clearinghouse that will collect, develop and distribute written materials. These will include:

- Listings of organisations and bibliographies of written materials
- Basic information on the cost and availability of different efficiency and renewable energy technologies
- Model legislation (good programs around the country and in other countries.)
- Ideas for ongoing local projects

On the national level, supportive tasks will be carried out by many participating organisations, to the degree of commitment they make to the programme. By relying heavily on the existing staff of participating groups and by emphasising planning at the local level, the financial costs of the programme's implementation should be kept to a minimum and the need for a large administrative staff eliminated. Furthermore, the decentralized and low-cost structure put into place for this programme is one that should be sustainable and thus able to continue to support these and other ongoing activities in the months and years following beyond SUN DAY 1992.

Though focussed primarily on the United States, efforts will be made to alert organisations in other counries to encourage them to launch parallel efforts. At the very least, there will be an ongoing exchange of information with such organisations.

Any person or organisation that wishes to be formally associated with this effort can do so simply by endorsing a short statement of goals. (See Box, previous page)

Contatct Address

Ken Bossong
Public Citizen
215 Pennsylvania Avenue, S. E.
Washington D.C. 20003 U.S.A.

Global Warming Impacts of Competing Energy Technologies

A recent advertisement distributed by the U.S. Council for Energy Awareness, the nuclear industry's public relation arm, claims that "Every time you breathe out, you release more carbon-di-oxide than the generation of electricity from nuclear energy." This ad is a part of nuclear industry's campaign to portray nuclear power as an environmentally clean technology that produces no CO2, the primary greenhouse gas, and is therefore a logical solution to the world-wide problem of global warming. The campaign's goal is to build support for the construction of a "new generation" of nuclear reactors at public expense.

Left. unsaid by the nuclear industry is the fact that many renewable energy technologies and energy efficiency options produce either significantly less or comparable amounts of CO2 than do nuclear power plants. During the last few years there have been a number of independent studies conducted by different organisations to find out what are the impacts of competing energy producing technologies on greenhouse gases.

U.S. Department of Energy

Dr. Robert A San Martin, Deputy Assistant Secretary for Renewable Energy at the U.S. Department of Energy (DOE) prepared the study, _Environmental Emissions from Energy Technology Systems: The Total Fuel Cycle._ When the total fuel cycle, including uranium mining, plant construction, and subsequent operations and maintainance, is examined, a boiling-water nuclear reactor actually produces 7.8 metric tons of CO2 per gigawatt-hour. While significantly less than that produced by the combustion of coal (964 t/g-h), the CO_2 resulting from nuclear generated electricity is equal to or greater than that produced by renewable energy technologies in most cases.

However, wood and biomass combustion coupled with the regrowth of trees actually reduces CO_2 concentrations by 160 t/g-h. This occurs because wood plantations create a carbon cycle over the life of a plant by absorbing CO2 from the atmosphere during crop regrowth. Emissions are further offset by the carbon storage capacity of the roots and other unharvested portions of the biomass that remain in place.

The DOE study can be obtained from Dr. San Martin's office at the U.S. Department of Energy, Washington D.C.

Friends of the Earth

The second study was conducted by Earth Resources Research Ltd. for Friends of the Earth (U.K.) and a supportingstudy was done by Dr Nigel Mortimer, an independent energy consultant. It found that operating a 1000 megawatt nuclear power station produced 230,000 metric tons per year of CO2 while renewable energy technologies operationg at a comparable output yielded three to four times less. Hydro power resulted in 78,000 t/y, tidal power 52,000 t/y and wind power 54,000 t/y. But most spectacular were energy efficiency improvements: fiberglass loll insulation - 24,000 t/y; polystyrene cavity wall insulation - 23,000 t/y and low energy lighting-12,000 t/y.

Furthermore, the FOE study notes that expanding nuclear power capacity worldwide would increase uranium consumption. However, only limited amounts of high-grade uranium ore are available. Additional uranium resources are known to exist at lower ore grades, but as the ore grade declines, larger quantities of energy, including fossil fuels would be needed to mine and process the ore. thus increasing the amount of CO_2 released. As the grade of the ore declines, CO_2 emissions eventually equal that of fossil fuel electricity generation. Dr Mortimer concluded that the "point of futility" - where as much CO_2 would be released in producing nuclear power as from direct use of fossil fuels - would be reached in just 23 years in U.K. if U.K. completely switched to nuclear power. The Friends of Earth report can be obtained from

FOE,
26-28 Underwood St.
London U.K. Nl 7JQ

Dr Mortimer's paper The Controversial Impact of Nuclear Power on Global Warming can be obtained from him at

cloEERU,
Faculty of Technology,
The Open University,
Walton Hall, Milton Keynes U.K.

Northwest Power Planning Council

The Northwest Power Planning Council has issued a third, related study: New Resources: Supply Curves and Environmenal Effects. This study attempts to quantify some of the environmental pollutants emitted by each electricity generating technology but only gives partial consideration to total fuel cycle impacts.

The report founded that "compared to all other resources except conservation, solar-thermal, solar photovoltaics, and wind are relatively benign" and their CO_2 emissions were quantified as zero. It added that the environmental consequences of hydro power are about the same relative level of servity as solar thermal resources. However, hydropower development is somewhat riskier, because of possible future fish, erosion, water use, and water quality concerns."

Finally, while stating that CO_2 emissions from nuclear reactors are "negligible," the report added that a typical commercial nuclear power plant does emit 8-9.5 curies of radioactive carbon-14 annually. It adds that nuclear power's "overall effect on the environment is about the same as natural gas" while cautioning that the risks of nuclear power are "dramatically different."

Copies of the report can be requested from

851 S.W. Sixth Avenue, Suite
1100, Portland, OH 9720-1-1348

Institute for Applied Ecology

West Germany's Oeko-Institute (Institute for Applied Ecology) has released a fourth stydy confirming that wind, small hydro, and solar technologies emit less CO_2 when their fuel cycle is considered that both fossil energy and nuclear power sources.

The study, performed under a grant from the Ministry for Economy and Technology of the German state of Hessen in Wiesbaden, found that micro-hydro units produce 200 kilograms (kg) CO2 per 100 megawatt-hours (MWh). Based on analyses of 25-kW wind and photovoltaic systems, the researchers found that the wind energy sources produced 3,000 kg CO_2 per 100 MWh..

By comparison, nuclear power generated 5,400 CO2 per 100 MWh. This is an amount greater than the gas-fired cogeneretion system considered in the study which generated only 3,300 kg CO2 per 100 MWh.

For more information, contact

Uwe Frische, Oeko-Institute,
Prinz-Christians Weg 7,
6100 Dramstadt, Germany

Rocky Mountain Institute

The findings of these four studies should be further considered in light of a 1988 study issued by the Rocky Mountain Institute, a private research firm based in Old Snowmass, Colorado. It concluded that investments in nuclear power actually contributes to global warming in that it precludes investments in more effective carbon dioxide abatement strategies.

The study, Greenhouse.Warming. Comparative Analysis of Two Abatement Strategies, assumes that the future cost of nuclear power drops to only 5 cents per kilowatt-hour of electricity produced while the cost of energy efficiency investments is only 0.5 cents per kilowatt-hour of electricity saved. At those costs, electricity efficiency investments would displace between 2.5 and 10 times more carbon than would similar investments made in nuclear power.

Consequently, the "environmental cost" of a six-fold expansion of nuclear power worldwide would total 17.3 million metric tons (MT) of CO_2 between 1995 and 2025 That is, "for every $100 invested in nuclear power as a CO_2 abatement strategy, one MT of CO_2 is released into the earth's atmosphere that could have been avoided had that $100 been put into efficiency."

The Rocky Mountain Institute can be reached at

1739 Snowmass Creek Road. Old
Snownmass, CO 816549199

Conclusions

The bottom line for all of these studies is that nuclear power does generate CO_2 when its full fuel-cycle is considered and will likely generate more as higher-grades of uranium ore are depleted and if new nuclear reactors are built.

While usually producing less than many fossil fuel options, nuclear power docs generated more CO2 than an array of energy efficiency and renewable energy technologies.

The nuclear industry would do the general public a service if it presented a more complete and accurate picture of its role in global warming than its current compaign is presently doing.

Furthermore, the high cost of nuclear power may preclude investments in less expensive energy option such as efficiency and renewables that have lower CO_2 emission.

In as much as choice will need to be made among competing energy options when deciding how to invest limited research and development dollars, energy efficiency and renewable energy technologies appear to be the better global warming solution in which to invest.

A Discussion of 'DEFENDUS'

When we look at the energy scenario over the next seventy-five to hundred years, it becomes clear that there are going to be major upheavals. The mainstay of today's energy - oil and gas are likely to be in extremely short supply. Coal and nuclear are already facing opposition because of their adverse environmental effects. Thus, the question arises, as to what would be the future sources of supply?

A paper entitled "Development Focussed Enduse Oriented Scenario (DEFENDUS), published by Dr A.K.N.Reddy and others was published in two parts in *Economic and Political Weekly* in its April 6 and April 13, 1991 issues. This paper not only identifies the reasons for the failure of the current electricity planning to deliver the goods, but also presents an alternative approach which emphasizes equity and sustainablity.

A two day discussion was held in Baroda on October 5th and 6th, 1991 to discuss in detail the DEFENDUS approach. The participants at the discussion ranged from energy specialists, power engineers, rural development workers, environmental activists... In other words a typical I.I.T. crowd. The discussion ranged over the whole gamut of issues raised by the new DEFENDUS approach—the general theory as well as difficulties associated with the introduction of some specific new technology. Out here we shall briefly present some of the points raised by the participants.

DEFENDUS Approach

The Development Focussed End Use Oriented Scenario is based on a three pronged approach which encompasses both the demand and supply sides. These are:

- Assigning specific growth rates (as against an extrapolation of past trends) for various categories of consumers. These rates are determined by social goals like satisfying the basic needs of all and creation of maximum employment

- Maximising the use of demand side management techniques like increasingenduse efficiencies, load management and the appropriate substitution of electricity with other forms of energy.

- Use of decentralised and renewable energy sources to augment electricity supply

The Discussion

All the participants agreed that setting up specific growth rates for specific sectors is a valid methodology of managing the demand. In fact, this is precisely what is done by the conventional planning by assuming the continuation of past growth rates for future. This too, is a choice in itself, though it may not seem as such.

It is important to understand that the elecricity planning should address itself to not only supplying the projected demand, but should concern itself with the shaping the magnitude and the pattern of that demand in the context of social goals.

It is in this context that the search for alternatives assumes great significance. For example, the most needed evolution of low cost housing ideas based on composites and local materials would dramatically reduce the importance of cement industry. A shift towards organic farming has the potential to render a large section of the fertilizer industry redundant, thus reducing oil as well as power consumption. Similarly, use of sound water-shed management techniques can dramatically change the availability of surface and ground water and can bring down the consumption of irrigation pump sets to a very low level.

It needs to be emphasised that these kinds of efforts to evolve alternatieves are eminently desirable in their own right. The failure on part of the establishment to encourage and support such initiatives is driving us towards a more inequitable and energy intensive society. These errors need to be urgently rectified.

Unfortunately, a large part of the Indian electricity establishment has still not grasped the significance of the fact that improvements in enduse efficiency and load management offer the cheapest, fastest and the most environmentally benign option for managing increasing demand. While some agencies are making genuine efforts, these measures are considered at best as an appendix to the power planning excercise.

Many studies have shown that the potential for efficiency improvements is vast in the country. For example, Gujarat Energy Development Agency claims that 16% of the projected demand of Gujarat up to 2000 AD could be met by efficiency improvements alone. This comes to some 1,600 MW: far more than the capacity of the yet to be started Kakrapar Atomic Power Plant (470 MW). More attractively, the payback period of most of these schemes ranges from a few months to three years.

There are a number of specific efficiency improvement measures discussed in the DEFENDUS paper, like for instance, improvemerits in irrigation pump sets and introduction of compact fluroscent lighting. The participants in Baroda tried to pinpoint the difficulties and the problems which are a roadblock to the large-scale adoption of these eminently sensible measures. Thus, for example, it was felt that compact fluroscent bulbs which require a high initial investment are vulnerable to the erratic power supply obtaining in most of our cities and therefore require extensive field trials before they would become acceptable. On the other hand, efficiency improvements in irrigation pump sets has already proven itself in extensive field trials and needs to be vigourously implemented by the State Electricity Boards (SEB). Even if the SEBs were to bear the full cost of the necessary modifications, it still remains the least-cost and most attractive investment for the SEBs in terms of the capacity releaved for other uses. However, most people within the electricity establishment look at this only as some kind of subsidy to farmers. It is this kind of attitude, which is the major hurdle in the large scale implementation of these schemes.

The participants in the Baroda discussion also considered problems encountered with a lot of decentralised and renewublesources of energy. We shall be presenting their views on these in a future article in *Anumukti*.

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Environmentalism Becomes a Dirty Word in Czechoslovakia

My country is a notable example of unecological development. We breathe almost unbreathable air, some of our rivers are almost lifeless and food is contaminated. The agricultural landscape, which used to be the embodiment of fertility as well as beauty, has changed into a monotonous, neglected, large-scale production area. The woods, once famous among foresters, have either vanished or are in a catastrophic condition. The generic diversity of plants and animals has been decimated.

The devastation of the environment is linked to the devastation of values that Czechoslovakia has been exposed to for the last forty years. Citizens enclosed themselves within their families, whithin the four walls of their flats, or their weekend houses. Few were strong enough to resist. The idea of morality became secondary and the satisfaction of material needs became the official ideology. The ideas of progress and historical optimism became compulsory. It is symptomatic that the word link 'ecology crisis' was inadmissible even in specialized texts. The utilitarian view of nature and profound nnthropocentrism prevailed.

Yet, even in this dismal terrain of values, there remained an undercurrent of the opposite orientation which enabled non- material values, values of altruism, concern for fellow creatures and for nature, a super-generational and global way of thinking to survive. Some people turned towards religious faith and others became interested in the protection and preservation of nature. In the period of frustrated civil interests and blocked professional careers, nature became a refuge.

A more active form of interest in nature and landscape appeared in the course of the seventies. Nature conservation associations, which used to have a relatively long tradition in this country before they were disbanded after the Communist take-over, were revived. During the second half of eighties environmental movements became vents for letting out the tensions of opposition against the fading regime.

Our conservationists cleaned up fountains and brooks, rescued individual plants, kept records of ant-hills, protected amphibian migration on roads. If they could not prevent the construction of a dam. they at least transplanted bulbs of snow-flake from the future lake bottom to safer localities. The administration on the other hand was capable of transforming whole regions into wasteland with the stroke of the pen.

While the green and alternative movemnts in Western Europe were generated mainly from the radical Left orientation, it was quite the opposite in Czechoslovakia. Our environmentalists regarded the capitalist system and market economy with hope. In fact, they did not understand the standpoint of their Western colleagues. Ecological damage was perceived as a simple consequence of the centrally planned socialist system.

The political transformation of November 1980 seemed to bo the guarantee of a miraculous turning point in the ecological situation of this suffering country. References to the catastrophic ecolgical situation were among the main arguments in the speeches from the platforms in the squares during those and also in president Vaclav Havel's first New Year speech. The new government used to go to their first sessions together by bus! A number of new environmental initiatives appeared in the first post-revolutionary weeks. The Czech Green Party, awaited by the public for so long, was founded at that time. Opinion polls in January 1990 established that 83% of the population considered environmental problems to be the most important of our society.

Soon it became evident that the matter was not as simple as that. The new government as well as the mass media supported the idea of intense economic growth. The neo-liberal economists gained the upper hand. Environmental concerns have been put aside. The influential finance minister, Vaclav Klaus is of the opinion that, "We must earn enough to finance ecology", and "economy is like a cake and ecology only whipped cream on the top of it."

Conservationists are coming to be regarded as a reactionary force, hindering the rapid inclusion of Czechoslovakia among the advanced European countries. The essential attraction of green movement has disappeared. Some of the competent and politically conscious people who were active in the environmental opposition group have vanished. Some of them are in the government. They probably still sympathize with our movement, but it is not enough.

We can sadly sum up: the environmentalists' post-revolutionary hopes of changes in human values are dying and this country has been swallowed up by the desire to catch up with the West as quickly as possible. One of our 'unprofitable' environmentalist journals has ceased publication, while pornographic magazines sell well.

The small number of people who are still engaged in environmental activities have decided to reject high materia] consumption as the goal of our society. They are attempting to live a life of intentional poverty and alternative values.

Because our government wants society to be regulated by the principles of free market, and wants to exclude all interventions of non-economic character, including ecological interventions, our environmentalists have reached the same position as the majority of green movements the world Over: the position of criticizing an economy oriented towards the stimulation of material consumption. I think that only now have we fully grasped the concerns of our freinds in the Western environmental movements.

Hana Librova
Resurgence, Nov/Dec 1991

Letter Box

The Citizens Awareness Network (CAN) is a non-profit grassroots organization based on Shelburne Falls, Massachusetts. Most of our members live in small cities and towns located within the ten mile radius of the Yankee Rowe Nuclear Power Station, and within twenty miles of Vermont Yankee nuuclear reactor. Yankee Rowe, as you may or may not know, is the oldest operating commercial atomic reactor in the United States. (Yankee began operating in 1961.) Although at this time it is shut down, (Nuclear Regulatory Commission recommended a shut down due to "safety reasons" on October 1, 1991) Yankee Atomic has begun to spend millions of dollars to "improve" its operations and will seek to restart this summer. CAN, of course, will do what is necessary to prevent this aged and embrittled reactor from operating.

In the meantime CAN members have been researching the effects of longterm exposure to low-level radiation. One of the things that we have come across in our discussions with friends and neighbours is that there appears to be significant incidences of Down's Syndrome. (In the tiny, rural town of Buckland, for example, there are six Down's Syndrome children that I know of. All live within two miles of each other and four live within a quarter of a mile of each other. Buckland's population is around 1,000. Other health problems that CAN feels are significantly high for this area, and may be attributed to Yankee Atomic, include infertility, menstrual problems abnormalities, leukaemia, breast cancer, brain tumours and immune deficiency diseases.

CAN has brought our concerns to the Massachusetts Department of Public Health and with the help and support of U.S. Senators Kennedy and Kerry a preliminary health study may soon be underway.

We have also been concerned about tritium pollution in the Deerfield river. Yankee Rowe has been dumping liquid radioactive waste into this river for thirty-one years. The largest population areas are directly downstream and many people swim and fish in the river. There is also a possibility that many drinking water wells draw from the Deerfield River.

Kemp Houck at *Atoms and Waste* in Washington D.C. let me know about the survey work that you did in the villages surrounding the Rawatbhata nuclear power plant. I am most interested in receiving information about how you went about performing the survey as well as in receiving a copy of the survey results. As the size of the Rawatbhata plant and Yankee Rowe are similar (Yankee is 185 MW), I feel the results of your survey will be useful to the Citizens Awareness Network as a means of helping us along with our research and also in putting pressure on the Department of Public Health to take our concerns seriously.

Gail Steinbring
Citizens Awareness Network
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Shelburne Falls, MA 01370
U.S.A.

We want to take this opportunity to let you know we think your newspaper is wonderful and often wish we had the funds to make copies and send it to all our readers. Keep up the good work, and success in your struggle.

Ayn Lowry
Editor, WISE News Communique

On 22nd of November, 1991 a nuclear emergency preparedness drill was held in four villages near Rawatbhata. There was strong opposition from the local people to the whole exercise and the people of Jharjhani stopped all traffic (Rasta Roko). At a meeting that evening all expressed their opposition to the activities of the nuclear authorities. On 28th November, 1991, Ms Margaret Alva gave a statement in the Parliament that the diseases being seen in the Rawatbhata region are not due to radiation but are the result of malnutrition, water pollution and the lack of medical facilities. This statement has been given on the basis of the investigation carried out by the medical team from Udaipur Medical College and also claims that similar illnesses are not being seen in the workers of the nuclear power plant. The nuclear authorities seem to be now adopting an aggressive stance. When will the results of the Rawatbhata health survey be published?

Rotanlol Gupta
Rawatbhata 323305

I saw an abstract of your epidemiological study around the Rawatbhata nuclear power plant in WISE news Communique No.361. You announced that the full report, after finishing the analysis, will be published. Could you please send me a copy as soon as it is available.

I have full understanding of your plight to do this research on a shoestring budget against the opposition from official organisations. I like to commend you and your collaborators for your selfless efforts. If it were not for courageous individuals everywhere who can not be bought off, the truth about the costs in human lives, bourne by those without a political voice, of "technological progress" would never be known.

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Cleanup Costs Rise Sky High

For years, the U.S. Energy Deparment has been telling Congress that it would cost about $3 billion to close and decontaminate its three obsolete uranium enrichment plants, and for years skeptics in Congress have suspected that the real figures would be much higher. It appears the skeptics may be right.

According to a report by engineering consultants that was delivered to the Energy Department in August but never made public, the cost is likely to be $20 billion. An earlier draft in July, had put the cost at $37.7 billion.

The Energy Department has recognized that cleaning up radioactive nuclear waste and decontaminating nuclear facilities is very expensive, but was apparently shocked by the consultants projection. The estimate for just three uranium enrichment plants is nearly equal to the department's projected cleanup costs at all its nuclear weapons and uranium enrichment plants.

The department said in a statement that it would not "blindly rely on its contractor's estimates without challenging them and reviewing them to assure that they are well developed and worthy of presentation to the Congress."

The so-called "D and D" costs— "decontamination and decommissioning"— are a political hot potatoe because Congress must decide who will pay the bill when it comes due, probably within this decade: the taxpayers, the nation's nuclear utilities or the utilities' customers.

In public hearings last spring, the Energy Department stuck to its three billion cost projection. But under pressure from members of Conress, the department hired Ebasco Services Inc. of New York, a nuclear and environmental engineering subsidy of the Ebasco Corp. to assess the cleanup issue.

On July 15, Ebasco submitted detailed, site by site estimates. A total of $37.7 billion or $45.6 billion, depending on whether some building were to be abandoned or refurbished for new uses. "What's happened in this estimate is these guys figured sky is the limit," one source said. "It's way to high." But the House Interior Committee Chairman, George Miller, charged that the "gross discrepancy between Department of Energy's previous estimates of these cleanup costs and the estimates contained in the new draft report raises the possibility that the department has been deliberately misleading the Congress on this issue.

Guardian Weekly,
November 3,1991

Largest U.S. Nuclear Accident Since Three Mile Island

A major leak of tritium from the Savannah River Nuclear Weapon's Plant has contaminated the Savannah River and threatens the drinking water supplies of tens of thousands of South Carolinans. The leak, which let loose some 7,500 curies of radioactive tritium may have been the largest U.S. nuclear accident since Three Mile Island.

Contamination levels in the river were reported as high as 270,000 picocuries/litre—more than 13 times greater than the lax government guidelines permit. Water officials in the southern parts of the state were forced to shut off intake valves to the river, and had to rely on reserves for more than a week.

Public reaction to the accident was immediate, with even conservative South Carolina water officials calling for the shutdown of the plant. Public concern was probably heightened by the poor performance of Westinghouse, the plant's operator, in acknowledging the incident. Westinghouse in fact, seemed unsure as to when the accident actually happened; officials said only that it occurred between December 22 and 25.

The accident has, at least temporarily, shelved the Department of Energy's plans to restart its tritium producing K reactor in the Savannah River weapon production complex.

However, this is not the first instance of pollution by the weapon's plant. In a report released in November, 1991 the US Department of Energy (DOE) acknowledged, that it has routinely released substantial amounts (an average of 50,000 curies every year) of tritium into the air and water aroud the Savannah River Plant (SRP).

A South Carolina newspaper, *The Island Packet* recently reported that radiation has seeped into many streams near SRP and into the Savannah River in addition to the acquifers in the region. Across the river from SRP in Georgia, people have been complaining for years, about tritium in their groundwater and milk. In October, 1991, Georgia's Governer Zell Miller demanded a federal study regarding the contamination.

The releases have been occurring since 1950s. According to DOE, environmental releases of tritium were the result of a "widely held belief among weapon industry workers that tritium was less dangerous than plutonium, and other radioactive substances and thus required less careful control. Department officials themselves said DOE was more concerned about the financial implications of tritium loss rather than its environmental impacts. Tritium is used to enhance the fusion explosion of nuclear bombs. DOE's priorities are transparently obvious.

The Nuclear Monitor
Vol 7 No. 9, January 13,1992
WISE News Communique 364
December 19,1991

People's Initiative at Trisbane

Trisbane is a small village, population around a thosand, on the river Albe, some 30 km from Hamberg. It has the misfortune of being a neighbour of one of Germany's oldest power and research reactor sites

In the past, there was not a single case of leukaemia in the village, but during the last two years there have been a sudden spate of cases—seven children are suffering from the dreaded disease.

This leukaemia epidemic has caused consternation amongst the areas inhabitants. A burger (people's) initiative has been formed and they have forced the government to take notice. The government has appointed a high level committee of epidemeologists, radition scientists and radiobiologists to study the causes.

One of the members of this team of scientists, Dr Inge Schmitz-Fauerehake, told *Anumukti* that she has found a large number of dicentric chromosomal aberrations in the siblings of leukaemia sufferers and she is doing biological dosimetry in adults.

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U.S.$15/- per year or equivalent in other convertible currencies (airmail overseas)
(Rs.300/- per year if paid for in India)
Rs.250/- for life (only within India)
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Drafts should be drawn on State Bank of India, Valod (0531)

Editor: Surendra Gadekar

Subscriptions, donations, manuscripts, inquiries regarding circulation, etc. should all be addressed to:

Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist:Surat, 394641 INDIA

Please do not send cheques or drafts addressed to Surendra Gadekar

Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printry. Ahemedabad

PRINTED MATTER **BOOK POST**

ANUMUKTI

A Journal Devoted To Non-Nuclear India

Volume 5 Number 4 February/March 1992

Double Envelopment

The truth, the whole truth and nothing but the truth..

Recently I received a book entitled "Population Exposure to Ionising Radiation in India" produced by the Kalpakkam chapter of the Indian Society for Radiation Physics. The membership of this society consists of professionals from national laboratories, universities and institutions of higher education, industry etc. The society feels that, "In the case of ionising radiations, while its hazard aspects seem to have been overplayed for historical or other reasons, its full potential in the service of mankind does not seem to have drawn the deserved attention of the general public". Dr.D.V.Gopinath, the Director of the Health, Safety and Environment Group at the Bhabha Atomic Research Centre writing the forward to the monograph, enlarges the same theme. "The scientists and technologists who have been working in these areas firmly believe that nuclear energy and ionising radiations can be gainfully harnessed with least harm to the safety of the people or sanctity of the environment. On the other hand, there is also a growing fear in the minds of the public about the harmful effects of ionising radiation. The fear could be due to incomplete knowledge and may not have any scientific basis. In any case, if the utilisation of atomic energy is to gain public acceptance, it is essential that all information about the subject is made amply available to the common men, in a language he understands. It is necessary that we generate literature which, while retaining the scientific objectivity, is intelligible to the general public"

Apart from the sexist language used, nobody can take any exception to the sentiments expressed by Dr.Gopinath. But after reading such an introduction the least one expects is a book which would try to dispel incomplete knowledge, and in fact be a model of scientific objectivity. So, what does one find?

One finds that nucleocratic scientific objectivity consists of nothing but the same old concoction of disinformation and half-truths. To give just one specific example: in a table entitled "Population Dose from Indian Nuclear Power Plant due to Gaseous Effluent Releases" they claim that the amount of tritium released from Rawatbhata plant is 900 TBq a year. However, a paper entitled "Environmental Impact of PHWR Type Power Stations—Indian Experience" by another group of BARC scientists states that the tritium release to air from Rawatbhata during 1990 was not 900 TBq but 2562 TBq. What the authors of the first study have done, in their eagerness to project a rosy picture to the public, is that they have averaged out the effluent releases over the entire lifetime of the plant. A new plant emits far less effluents. Rawatbhata used to release just 25 TBq/year- a hundred times less than at present- when it started in 1973.) Averaging is thus a neat trick to make the plant look far less dirty than it actually is at present. One wonders whether the concern for scientific objectivity is in fact a concern for truth? "Scientific objectivity" is one prong of the nuclear counter-attack. The other prong is as old as the oldest profession—bribery of influential people and opinion makers. Being scientifically objective I suppose one ought to call it "public relations". Showers of nuclear bounty have been more plentiful than monsoon showers in Kakrapar during the last year. The Mandvi school has received Rs.5 lakhs and a promise of Rs.4 lakhs more. School teachers have suddenly found themselves inundated with offers of material help in the form of prjectors and other audio-visual equipment from the plant authorities. Even anti-nuclear sympathisers have started receiving invitations to tea...

Double envelopment is a military concept pioneerd by Hannibal at the battle of Cannae. Indian nucleocrats are not Hannibal. They better stick to their double containments. One can only remind them of our national motto: Satyameva Jayate.

* * *

Heavy Water Smugglers

Norwegian Daily *"Aftenposten"* disclosed on February 4,1992 that Roumania acted as an illegal broker to a purchase by India of Norwegian heavy water. (See *Anukukti* Vol 2 No.2, 3, October/December 1988). Heavy water is a vital component of the Indian nuclear programme.

According to *Aftenposten,* Norway sold 12.5 tonnes of heavy water to Roumania in l986. The heavy water shipment was immediately diverted and sold at a far higher price to India which was on the hunt for heavy water. Had the Norwegian authorities examined the matter properly they would have discovered that the Roumanian reactors were not then ready for test runs, leave alone production. *Aftenposten* claims that the heavy water was delivered to an Indian firm situated at Palton Road in Bombay, which is a participant of the Indian nuclear programme, according to official Indian sources.

From the Editor's Cycle

The creek that separates Nargol from Umbergaon is a breathtakingly beautiful sight. There is the grey water, the dark sand with large seashells of various hues; the cocconut trees rising luxuriantly in the distance, the hills forming a backdrop. But most impressive of all are the boats, festooned with multicoloured flags stacked closely together. The scene was drenched in bright sunlight reminding one of that painting by Vincent van Gogh. Unfortunately, unlike in the painting there was no drawbridge nearby. To go to the other side by road is a roundabout of 25 km.

We (the cycle yatris) had decided to cross the creek by boat and were proceeding towards the embarkation point. I was, as usual, somewhere near the rear when I suddenly saw a person running wildly towards us, shouting and waving his arms. The boat was about to leave so I waved the others to go ahead and I stoppped to talk. By the time he reached me he was a bit breathless and anyway his Gujarati accent was unfamiliar to my ears. "Where are you going?" To Kerala," I replied. "We have come from Kakrapar in Surat district and there is a nuclear power plant being built in our vicinity. And we are going on cycles so that we can meet people and talk to them about our problems and listen to them." "Come and have tea with us," he said pointing to a small row of hutments in the distance.. We let the ferry go and walked over to his home. They were migrant labourers from Kathiwar who had come three months ago to this area. The tea they gave us revived us wonderfully, and we decided to sing. None of us sings very well and together we can cause quite a cacophony, but that day we sang from our hearts. Take Gandhi's way. This is the last chance." The very next day, a family thought us to be a gang of dacoits responsible for a spate of dacoities in the area, and were affraid to even talk with us. It takes all kinds.

The response to our appeal in the last issue of Anumukti regarding the yatra has been truly overwhelming. So many groups and people have given us help in such large measure through their time and money and organizational skills that one feels humble. At the same time one feels a resolve that we better be strong enough to be worthy of so much love and trust. All of us felt especially gratified and strengthened by the love and enthusiasm of the people living near the Kakrapar Atomic Power Project, who gave us a grand send-off the day before we started out on the yatra. Five young friends from the area have joined in the march. The people of Kakrapar contributod to our morale in a big way by resolving not to allow any plant official to enter their villages for conducting any kind of survey.
It is always difficult to organise and properly coordinate an effort which needs the cooperation of many different individuals to succeed. There have been many mistakes and slips on our part. However, the response till now and the many different expressions of support are a very happy augery for the success of the yatra. In fact, J have become so bold that I have decided to attempt this issue of Anumukti on the run. The 'dust' has, perhaps, reflected in the colour of this issue, which owes far more to Manoj and Peter than to me. Without their help the idea would have been stillborn..

An outline of the programme:

Commencement from Vedchhi: March 22, 1992
Entering Maharashtra; March 25,1992
Entering Goa: April 11, 1992
Entering Karnataka: April 15,1992
Entering Kerala: April 24, 1992
Conclusion in Peringome April 26 1992

Genetic Effects of Radiation

Since 1985, elevated rates of childhood leukaemaia have been reported around a number of British nuclear installations, in particular Sell afield, Dounreay, Aldermaston, Burghfield and other pre 1955 built nuclear power stations. However, simple geographical associations don't prove a causal link with these plants. Both the nuclear industry and its regulators have consistently argued that the doses received by the victims would have been too small to account for the observed incidence of leukaemia. Consequently, even though considerable scientific uncertainty was attached to these exposure estimates, the industry argued that it was not responsible for the leukaemias.

This argument was, however, severely weakended in February 1990 with the publication of the Gardner study, which reported an association between paternal pre-conception radiation exposure and children's leukaemia risk(1)
What is particularly important about Gardner's study is that a genetic mechanism is implied for the expression of the risk—that is, the father's radiation exposure leads to some form of the damage, or change, in the genetic material transmitted to his children.

This was reported as a completely new and unexpected finding. An excess of childhood cancer amongst the offspring of the Japanese atomic bomb survivors has not been seen.(2) In fact, no significant excess of any type of genetic damage has been seen in this population, or in any of the other populations used to provide information on the risks of radiation exposure. The vast majority of our information on the genetic risks is derived from animal studies.

The lack of information is reflected in radiation safety standards which do not take account of the probablity of genetic damage occuring in offspring of those exposed. Radiation dose limits are based upon the risk of developing a fatal cancer in the exposed individuals and not in their children. Before the publication of Gardner most authorities considered that genetic risks had been adequately assessed and if anything overestimated. This has not changed with the new ICRP recommendations, despite Gardner's findings. The ICRP, the nuclear industry and its regulatory authorities still consider that genetic risks are small compared to the fatal cancer risks faced by radiation workers or members of the public.

The lack of confirmation for Gardners findings in the atomic bomb survivors led many commentators to suggest that Gardner, therefore, must be wrong. For instance, one geneticist working with the US Government's Oak Ridge National Laboratory has been quoted as commenting: "It is completely impossible to conlude that the increases in childhood leukaemia resulted from radiation exposure of the fathers."(3)

Another scientist from the Radiation Effects Research Foundation, the joint US-Japanese funded institute studying the atomic bomb survivors, comments: "the estimated paternal doses to the Sellafield workers are too low to the result in the end point being discussed, ie. childhood leukaemia."

Support for Gardner Study

Two other human studies have also suggested a link between paternal pre-conception exposure and childhood leukaemia. The first, published in 1966, was mainly concerned with maternal exposure. However it also pointed to an association between pre-conception diagnostic paternal and childhood leukaemia that was of "borderline significance".(4) The second was a case-controlled study in Shanghai publlished in 1988.(5)

Other scientists have argued that if genetic damage is occuring then an increase in congenital malformations would be more likely than an increase in childhood leukaemia(3) However, some experimental work on mice suggests that both type diseas may be induced in offspring. This work, by Nomura, was cited by Gardner as support for his observations. Nomura suggested that paternal exposure induces heritable tumours in first and second generation progeny as well as genetic anomalies. These tumours were mainly of the lung, although lumpocytic leukaemias were also found.(6)

Obviously, Gardner's work has yet to be confirmed at oilier installations with excesses of childhood cancer. Nevertheless, Nomura's experiments pose a further question. Does occupational or environmental exposure to ionising radiation lead to an increase in rates of genetic diasease, and if so is this also associated with childhood cancer? The nuclear industry, no doubt, would argue that this would not be the case.

The suggestion, however, is not that unreasonable. Some work conducted in the 1960s by American epidemiologists, suggests that clusters of childhood cancers and congenital malformations may occur together.(7) It is also known that some people with particular congenital malformations, such as children with Downs' Syndrome, are at an increased risks of developing leukaemia. Thirdly, similar biological mechanisms, related to somatic and germinal mutations, may be involved in the etiology of both categories of diseases.

Consiquently, as well as of looking for further associations between radiation exposure and childhood leukaemia, it might be profitable to look for evidence of an increased risk of congenital malformations amongst offspring of radiation workers, or amongst populations living around nuclear installations.

Astonishingly, hardly any work has been done in this area! This might seem incredible seeing as a link between ionising radiation and genetic damage was first demonstrated in 1927, but it is true.

In 1955 a study was published that compared the rates of genetic diseases amongst 3,751 US Radiologists and a similar population of medical specialists who were not exposed to radiation. The information was obtained by questionniare, with a 74% response rate for the radiologists and 54% for the non-exposed control group. The majority of respondents were male. The study found a consistent trend of higher rates of abnormality in the exposed group. The study, which made no attempt to assess the doses received by the radiologists, concluded: "The differences are not of large magnitude and in themselves would not be viewed with alarm. These abnormalities occur, however, in the first generation of offspring and visible first generation effects represents only small fraction of the total damage that may have been inflicted."(8)

Surprisingly, similar large scale studies of congenital malformation rates amongst other populations of radiologists have not been conducted. In the UK, the Office of Population Census and Surveys collects data on rates of malformations, and regularly publishes reviews of regional trends. In 1985 it also published a survey of rates between different occupations for the years 1980-82. For females radiologists the data was strongly suggestive of an increased incidence for a number of classes of malformations (cleft lip and cleft palate; tracheo-oesophageal fistula, oesophageal atresia and stenosis; and Downs' Syndrome).

The result for one particular class, rectal and anal atresia and stenosis, were statistically significant. This report did not provide a breakdown into classes for male radiologists, but for all malformations together the result also suggested increased incidence.(9)

Anecdotal data

Obviously, data such as this is only anecdotal and should be interpreted with caution, particularly in view of the small time-scale and small number of cases involved. However, this data along with the US radiologists study, does indicate a medical trend which should be investigated. For instance, in the UK there are around 10,000 members of the college of Radiographers, yet no one has ever conducted a study into the rates of congenital malformations amongst their offspring.

A number of other studies have looked at the relationship between Downs' Syndrome and radiation exposure. Most of these are concerned with the effects of medical diagnostic X-irradiation, mainly on women. Again, these studies point towards a correlation, although some of the evidence is contradictory.(10)

Only two studies have ever been conducted of congenital malformation rates amongst nuclear workers and in the surrounding communities. Both of these were published in 1988 and are by the same author, Lowell Sever. They were concerned with the Hanford Site in Washington State, which was built in 1943-44 to produce plutomium for the US atomic weapons programme. Server founded a statistically significant excess of one type malformations (neural tube defects) amongst local communities. Increased rates were also seen for other malformations including anercephaly and spina bifida.(11) The second study showed a statistically significant association between occupational exposure of fathers and neural tube defects in their children. For all malformations considered together, the study suggested a correlation that approached statistical significance.(12) When these studies were published the author conluded that they represented false positives, ie. a casual relationship was unlikely, as similar findings had not been reported in other populations, particularly the atomic bomb surviors.

Following Gardner's report it seems that Server may be reconsidering this conclusion. In February this year he wrote that "more attention needs to be paid to the potential effects of paternal exposure to low-level ionising radiation on reproduction and child health."(3)

He is currently conducting a case-controlled study of childhood leukaemia around Hanford in an attempt to replicate Gardner's association. Gardner, in turn, is conducting a study of congenital malformation rates around Sellafield.

At present genetic risk estimates used by ICRP and UNSCEAR take no account of either heritable tumours or congenital malformations. If Gardner and Server are able to replicate each others findings this will provide powerful evidence that genetic risks,like cancer risks, have been consistently underestimated.

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Earth Summit and the Global Death Machine

In June this year 120 heads of States and some 15,000 representatives of environmental NGOs are meeting at Rio de Janero, Brazil to discuss ways and means to save the planet for our common survival: This first Earth Summit, is taking place four years after publication of 'Our Common Future' by the UN Commission on Environment and Development (UNCED), chaired by Ms.Gro Harlen Brundland, the then Prime Minister of Norway. The Commission takes note of the early warning environmental signals and calls for immediate and appropriate responses, globally.

The Centre for Science and Environment, Delhi (CSE) has circulated a draft, statement, which is a position paper for the governments of the South and NGOs supporting the third world causes. CSE Global agenda has been widely accepted by southern governments as well as a cross section of environmental groups abroad.

Part I of this paper summarises the CSE position. The summary reveals that the document, a very important one of course, could have been little more analytical in indentifying the causes of the crisis. That is what is attempted in Part II of this paper. The author does not intent to chart out an alternative agenda, for that is left to the imagination and creativity of the reader.

Summary of CSE Draft

The causes of environmental crisis in developing countries is, according to CSE, "over-exploitation of ground water and surface water, land degradation, deforestation", hence, "given the extreme pressure on natural resource base for daily survival on one hand, and economic growth, on the other, only an extremely well thought out holistic strategy of rational resource exploitation will be able to reconcile environmental constraints with development requirements."

The document is critical of the Northern dominated financial institutions for international trade, aid and debt becoming green linked, with the rich in the world demanding that their dollors and yen be spent in the South only in a way that secures our "common future". (There is no evidence of World Bank etc becoming green-sensitive, except in their press briefings.)

Part II of the Statement contains new visions about the future shape of world, with democratic institutions at three levels, ie. community, national and global. They will be based on community's right to manage its immediate environment through open and democratic institutions and the right to a clean and healthy environment It demanded "a fair world" in which all pay the full cost of their consumption. The draft demands that "all nations at the Brazil conference must take a pledge that they will develop a new tier of governance within their countries a tier of community level governance through open, participatory institutions with inalienable rights over their immediate environment to care for use and manage."

Since the Summit is global, the main agenda revolves around those global issues which need to be resolved immediately. Part II of the statement—the agenda for Global Environmental Democracy- contains two issues which will be raised at Rio, viz. the Global Right to Survival and Equal Right to the Atmosphere. There are two more issues, Right to Information and appropriate compensation for community biological knowledge.

Global Right to Survival

"Global Right to Survival with a certain modicum of dignity" is the most fundemental of human rights. There can be no discussion of international environmental solidarity as long as the world remains starkly devided between the rich and the poor.

"The vast number of the unemployed in the developing world provide us with an extra ordinary opportunity for undertaking a massive global initiative for ecological regeneration and restoration of the natural resource base on which the poor depend for their survival"

The Scheme

"If an internationally guaranteed Right to Survival was backed up with an appropriate programme which guaranteed jobs in ecological regeneration, albiet at a survival wage, people need not flee their homes when drought or any other adversity strikes.... Everyone will be ensured a survival wage so that they have the purchasing power to eat. Nobody has to sell off their cattle and other assets in acute distress. Nobody has to go to bed hungry."

The global expenditure for this task has been estimated at US $30 to 40 billion, less than 5% of the global military spending. This money, to be paid by the rich nations "should not be seen as a measure of charity, but more as a measure of the payment that the rich ought to be making for their existing consumption."

According to CSE, over and above the greening of wasteland, this programme will "drastically weaken the forces that engender oppression by freeing people from the clutches of money lenders and landlords." One fails to understand how an employment generation programme, (ensuring just survival wages) will alter the power equation between the landlords and the poor.

Equal Rights to Atmosphere.

The planet is getting hotter because of the increasing concentration of carbon dioxide, methane, nitrous oxides and chloro-flouro-carbons—the so called green house gases, (ghgs). Carbon dioxide from fossil fuel burning accounts for more than two-third of the green house effect. The USA, the USSR and Western Europe with less that 20% the world population account for 58% global carbon emission. This threat can only be eliminated by bringing down the ghgs emmission to the pre- industrial level, which is not in the international agenda now. The Intergovernmental Panel on Climatic Change (IPCC) recommends a 60% cut in CO_2 to hold the concentration at its present level. This will necessitate fixing natioinal quotas. The industrial lobby in the North wants national quota to be based on the current emissions.

CSE argues that the "global aggregate should be allocated to each individual equitably, each nation's quota being equal to the sum of its citizens' quotas. Entitlements thus created can be traded. Those not using their share can sell them to those that are exceeding theirs."

Analysis of CSE draft.

The draft puts undue blame on the average consumers in the North and refuses to indentify the role of (a) military industrial complex in all countries and (b) rich consumers in the third world who are equally responsible for the green house mess. The draft miserably fails in identifying the contradictions within communities most of which are antagonistic. Every nation in the world today is a battle field with groups of unequal status and power, based on primitive considerations like caste, class, gender and race. It refuses to charge sheet the global Military Industrial Complex (MIC) in dirtying the local and global commons, and of course, increasing the concentration of ghgs. Let us examine these questions in detail in the Indian context

The Modern Sector In India

India today has an indegenously built mining-manufacturing-nuclear complex, with a death machine, the second largest in the Southern countries, which includes plutonium fuelled bomb and an efficient delivery system. The indegenous people's land have been snatched away for mining, the hazardous wastes are eliminated in the easiest way, air in the industrial cities is as polluted as that of Tokyo. A backward technology, lax environmental laws and inadequate/corrupt enforcing machinery, has virtually destroyed large stretches of farms and forests.

Industrialisation did not bring any radical changes in the country as prophesied by Karl Marx. On the contrary, it has only helped in reinforcing the existing contradictions. At the receiving end of this modern violence are also the traditionally oppressed groups like tribals, the lower castes and women. Urban India does not kill its female infants, instead, they employ the latest in modern medical technology-amniocentesis.

The per capita carbon emission by the an Indian 0.2 tonnes per annum. CSE and some NGOs in the North would like, to consider this as survival emission as against the luxurious emission in the North. Most of the emissions everywhere, is to promote super-consumption and to erect the death machine. If disaggregated emission statistics for the rich and the poor in India is considered, the rich, some 2% of India's total population will be emitting around 2 tonnes of carbon a year.

India's Record of Democracy

The government of India and those in the states have not been very friendly with people who interrupt their development project The mega disastrous projects like the dams on Narmada and Tehri are literally forced on people, inspite of popular objection. For over a year now, people in Kerala, have been agitating against a proposed nuclear power plant. For over half a decade now, coastal villagers at Baliapal have been protecting their land from the military which wants to build a missile test range. There is an increasing tendency to find military solutions to social and historical problems. Free movement is not possible in around a quarter of India's territory because there are just too many armed men out there.

The Global Death Machine

Peace Researcher Johan Galtung is of the view that USA is a third world country. "While it is certain that the US still has many rich people and possesses awesome military power, the unyielding unemployment, the 24 million

Americans on food stamps and the one child in five that is raised in poverty outstrips the gloomy realities of many Third World countries. Other indications of this tendency are the grave insufficiencies in health insurance and the extent of functional illiteracy."

The American war machine, which also caters for the military ambitions of the third world, is responsible for more than half the global and local pollution. Since the II World War, USA has spent 2.75 trillion dollars on production and delivery of nuclear war heads alone. Clean up of the Weapons' complexes will cost another 100 billion in 1988 dollars. In an in-depth analysis of US MIC and the health of US economy, Seymour Melman observes: "With a combined address to disarmament and economic conversion we can strike at the heart of the single most dangerous political process of our time. That is the antagonistic co-operation whereby the war-making institutions of the US and the USSR have reinforced each other and generated larger budgets, larger military economies, larger stocks of more dangerous weapons, and in so doing we have justified more centralism, and greater authoritarianism in each society. These processes lead, in both societies, to economic exhaustion and political/moral decay. I know no single public issue that is as crucial for the survival of society as disarmament and economic conversion."

Melman compares the ratio of military capital fund with the Cross Domestic Fixed Capital Formation (money value of civilian capita) items - school buildings, factories, machinery, roads, waterworks, libraries etc.). For every 100 $ spent in civilian sector, MIC amassed 40 dollars in the US. Other major nations - USSR 66, UK 31, France 16, Sweden 12, West Germany 13, Japan 3.3. (Anne H.Ehrilich & John W.Birks (Ed.) Hidden Dangers, Sierra Club, San Francisco, 1990.)

The following statistics will reveal who is belching out more carbon, whether an average consumer or something else.

The table is revealing. Per capita emission of carbon has little correlation with the people's well being or consumption. America has lot of poverty, inspite of being the largest emitter. The second largest emitter is USSR, which is more than double that of Canada. The USA, the USSR and Western Europe with less than 20% of the global population emitted around 60% of carbon. They also happen to be the biggest producers of nuclear energy (three- fourth of the global generation).

The per capita emission statistics have been often used to blame the entire people of industrialised countries. An average northerner does consume much more than what is needed for a meaningful existence. However, disaggregated statistics will reveal that the Global Military Industrial Complex is by far the bigger culprit.

Implications of the New Carbon Agenda

The present inequality in control over community assets and natural resources at the community, nation state and global level will remain, inspite of Rio summit. How will the new Carbon Agenda, proposed by CSE and supported by third world friendly NGOs abroad affect the poor. This has to be seen in the light of near total surrender of all third world economies to the Northern dominated institutions and the World Bank's recent advice for the hazardous industries to migrate to the developing countries, which are "relatively under-polluted"

It will be in the interest of the third world and the first world elite to set up heavily polluting and energy intensive industries in India, exploiting its vast coal and mineral reserves. Pollution control laws are lax, control agencies are weak and corrupt, environmental awareness is at a low ebb. A faster rate of economic growth can be expected in the third world. Under the existing laiesex faire mood, when socialism has become a bad word, the future generation of misery will also be much faster.

It seems that while thinking globally, the NGOs have forgotten about the local catastrophes from modern technological marvels. For every tonne of carbon emitted, there will be tens of tonnes of other solid, liquid and gaseous wastes, which will kill the local ecosystem. For instance, mining and burning coal alone will increase the radioactive burden of the land and atmosphere by belching out radon and radium. Among other local hazards are sulfter dioxida and fly ash which contains many trace metals which can cause cancer or genetic disorders.

Rio summit, taking place in the 500th year of Columbus, could either vow to strengthen the colonial values and all that came out of the discovery of the New World. Or it could resolve to take the necessary diversion. Those presiding over the heavily armed death machines, gray men in gray suits with bullet proof vests inside will hardly be able to think about survival - except their own. Nor environmental NGOs who speak for their "nations". Healing the earth needs a little more than militant nationalism.

If the Earths summit ends up with carbon quota and survival wages for the green brigade, without addressing to the basic questions, nothing would be lost either. May be it will remind all of us that nineteenth century institutions and ideas are insufficient to look beyond 20th century.

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Global Energy and Carbon Balance Sheet

Country or Region	% Of Global Population (1986)	% of Global Fossil Fuel Consumption (1990)	**Per Capita** Carbon Consumption (Tonne)1990	% Global Nu**clear Energy (1989)**
USA	4.98	24.80	7.24	31.18
USSR	5.77	17.70	4.47	11.25
Australia	0.52	1.4	3.92	0.0
Western Europe	7.86	16.40	3.04	35.23
Middle East	3.58	3.40	1.38	0.00
Latin America	8.37	5.10	0.88	0.49
China	22.16	9.20	0.60	0.00
India	15.84	2.40	0.22	0.43

Chernobyl Revisited—Five Years On

Zhores Medvedev is a super detective of the nuclear age. His book Nuclear Disaster in the Urals is a classic of scientific detective work which exposed the 1957 explosion in nuclear waste stored in the Urals despite the best efforts of the Soviet authorities to cover up the accident, and the deep scepticism of Western nucleocrats, who thought that an accident of the type described by Medvedev was "physically impossible". The following article which was published last year in the nuclear industry journal, Nuclear Engineering International is a fine description of the conditions around the Chernobyl reactor five years after the accident.

Last summer, I was invited by the Institute of General Genetics of the Academy of Sciences of the USSR to participate in the First International Conference on the Biological Effects of the Chernobyl Accident. The letter of invitation proudly announced that I was invited to the "world capital of radiation". The conference was planned in two venues—inside the "exclusion zone" in the town of Chernobyl, and at Zeleny Mys, a small working settlement just outside the exclusion zone built for the shift workers who took part in the cleanup operations after the accident. It was to last for nine days, and apart from the discussion of scientific papers, there were to be excursions to the nuclear plant, to experimental stations inside the exclusion zone, and to the radiological reservation which shows the effect of different levels of radiation on flora and fauna. Although there had been little advance publicity about the conference, when it opened on 10 September 1990, the response from the scientific community was impressive. About 250 papers were presented for discussion, about 50 of them from Western scientists.

Censorship

By 1990, hundreds of papers had been published in Western academic journals on the environmental, agricultural and medical problems related to the radioactive fallout from Chernobyl. The presence of some twenty Chernobyl radionuclides had been charted for each year after Chernobyl in humans, and in the soil, plants, animals and agricultural produce of different countries from Europe, Asia, America and North Africa. In fact, a whole new branch of radiobiology came into existence, because fission radionuclides from a reactor core had never before fallen out over the whole of the northern hemisphere as a result of a reactor accident.

It seemed curious, therefore; that Soviet academic journals in the fields of radiobiology, radiology, radioecology, environmental studies and genetics had remained silent about Chernobyl. For reasons that were not immediately clear, not one academic study had been published in the USSR on Chernobyl related radiobiological problems by 1990. From the outside it looked as if Soviet scientists were missing opportunities and neglecting their obligations. The conference at Chernobyl proved that this was not the case. The problem was censorship.

Soviet Research

As early as May 1986, more than 30 research institutes of the Academy of Sciences of the USSR, the Ukrainian and Byelorussian Academies, and various other ministries had set up research stations inside the heavily contaminated areas. A significant amount of research was carried out on plants, animals and general ecological problems. Most of the resulting reports however, were classified as secret or marked Tor internal distribution only". In June 1990, the Supreme Soviet passed a new law on the freedom of the press. It banned press censorship and also had a beneficial effect on Soviet academic literature. The majority (but not all) of the studies on radioecology relating to Chernobyl have now been declassified. The exceptions, still considered sensitive information, are reports that contain quantitative data on the contamination of agricultural produce in regions close to Chernobyl and those with details about the health impact.

Fallout Maps

The first detailed maps of the pattern of caesium-137 contamination of Soviet land were published in 1990. They showed the distribution of caesium-137 towards the end of 1989, when the levels were well below those of 1986 and 1987. Ukrainian and Byelorussian newspapers also published maps of contamination with the other long-lived radionuclides, strontium-90 and plutonium-239/240

The maps indicate that the initial 30 km radius exclusion zone from which people were evacuated in April and May 1986 was significantly amended later. On the eastern side of the accident site it was reduced, while on the western, north-western and northern sides it was extended and many new villages were evacuated in 1987. In 1989, 325 km^2 of populated area was still contaminated with caesium-137 levels above 40 Ci/km (1500 kBq/m^2). Some spots, situated in Byelorussia and Bryansk region of Russia—some as far as 200-250 km from the accident site—had much higher levels of contamination. About 33,800 people live in rural communities in the areas which are designated "areas of strict radiological control". Because they are now approaching the 35 rem "emergency permissible limit" of whole life absorbed radiation dose introduced by the USSR Ministry of Health, they will be resettled in 1991-1995 and the agricultural land in those areas will be reforested.

There is a much larger area of 715km^2 outside the exclusion zone where the level of caesium-137 contamination is from 15 to 40 Ci/km^2. The 234,000 people who live in this area were entitled to receive clean milk and other produce from uncontaminated regions and they received a small amount of financial compensation. Those benefits and periodic medical checks were recently extended to the 545,000 people who live in the 1409 km^2 area where the caesium-137 is between 5 and 15 Ci/km^2 . Because the distribution of contaminated spots was random, however, and isolines of different levels of radioactivity often divide the fields and pastures of the same collective farm into several parts, it was finally decided in 1990 that all areas with concentrations of caesium-137 above 1 Ci/km^2 would be considered contaminated. The approximately 3,070,300 people who live in those areas receive modest compensation payments of 30 roubles per month.

By way of comparison it is useful to note that the highest level of caesium-137 contamination in the United Kingdom in May 1986 (in a few small spots in Cumbria and North, Wales) was around 0.5-0.7 Ci/km^2 and resulted in lamb and mutton being contaminated above the permissible limits for meat sales in the U.K.. The USSR contamination levels were given only for late 1989, they must have been significantly higher in 1986 and 1987.

Hot Fuel Particles

During the conference, a great deal of attention was paid to the problem of "hot particles" (microscopic insoluble fuel fragments of various sizes). These particles can be trapped permanently in the lungs of individuals who inhale them. In addition to the more homogenously distributed radio-active material, hot particles were present in the Chernobyl fallout in various countries and they were studied quite intensively.

In the Soviet Union, the density of distribution of hot particles and their size was proportional to the distance from the accident site, probably becuase larger particles had a lower capacity to remain airborne. In one study, 50-60 hot particles per square meter were identified on the soil surface at a distance of 50 km from the site in 1988,5 at a distance of 75 km and 2/m^2 in Kiev, 130 km away.

Higher concentrations were found west of the reactor than in other directions. In some places the density was 10/cm^2 It was also found that larger hot particles were pieces of UO$_2$ fuel grains which were split and dispersed by the first explosion, whereas smaller particles were released with the graphite fumes in the days after the explosion.

Closer to the Chernobyl reactor site there were not only microscopic fuel fragments that created small "gamma fields", 2-5 metre in diameter. A special team of experts is still searching for these "hot spots". When they are found, they are fenced, marked and later deactivated. Walking in the forest outside the exclusion zone, 1 saw several such spots. With my personal dosimeter, I could see that the radiation levels of these spots were several orders of magnitude higher than the forest background levels which were not more than 50% higher than the natural background.

Inside the Exclusion Zone

It is expected that some parts of the 30 km radius exclusion zone will be suitable for human activity in the future. But there is a smaller; 10 km radius zone within it which will always remain a radiobiological reservation. It is very heavily contaminated, not only as a result of fallout, but because it contains nearly 800 nuclear waste disposal sites, many of them rather primitive. Contaminated equipment, transport vehicles, clothing, topsoil scrapped from about 100,000 acres, asphalt from the Chernobyl station site and the town of Pripyat, trees from the "red forest" (nearly 1,000 acres of pine forest close to the plant and killed by the first radioactive plume), and many other items classified as nuclear waste were buried here in pits and trenches during the second half of 1986.

These disposal sites have begun to leak and contaminate the ground water. There is, as yet, no programme for cleaning the whole area.

The Sarcophagus

The main concern, however, relates to the sarcophagus itself—the reinforced concrete cover built around the stricken reactor. During the conference, some participants managed to get a copy of a small booklet published in 1990 in Chernobyl by A.A.Borovoi, senior scientist at the Kurchatov Institute of Atomic Energy. Only 250 copies were printed of this summary of a study of the state of the remaining nuclear fuel and the rubble of the destroyed reactor. The aim of the study was to decide what should be done to provide a permanent solution to the problem of the reactor.

The sarcophagus is not expected to last more than 20-30 years. More than 90% of the original nuclear fuel is still inside. The metal structures, particularly those that hang from the 2000 ton top plate that was shifted into a verical position by the explosion, are unstable. By using special periscopes, it was found in 1989 that the reactor vessel is now empty. The bottom plate of the reactor pit was also smashed 4m down by the explosion. Melted reactor fuel was dispersed in different rooms and spaces below the reactor pit However, the melted fuel and radioactive lava which was solid in 1988 is now becoming brittle and softer and changing into dust under the influence of elevated temperatures and radiation.

It was found that the fuel material is subcritical, but its physical instability creates problems because the sarcophagus is not leaktight. It has nearly 1,000 m2 of holes and can "breathe". It contains about 700 kg of plutonium, and about 7 million curies of caesium-137 (81 kg) and 6 million curies of strontium-90 (43 kg).

The Ukrainian government and parliament has passed a resolution demanding that the Ministry of Atomic Energy of the USSR not only shut down the three reactor units still in operation at Chernobyl, but also dismantle the sarcophagus and decontaminate the site. But it has been calculated that this project, called the "Chernobyl green field concept", is too expensive. Moreover, there is no technology available yet to do the job. The Kurchatov Institute of Atomic energy considers it impossible to remove the sarcphagus. The Institute favours the construction of an extra structure, temporarily known as "sarcophagus-2", which will be hermetically sealed and strong enough to withstand the possible collapse of the metal and concrete structures inside the present sarcophagus. It should have a design life of several hundred years. They expect that in the distant future, when caesium-137 and strontium-90 no longer present radiation problems, our descendants might have invented a better technology to dismantle the reactor.

Zhores Medvedev
Nuclear Engg. International,
April 1991

Ban lonisation Smoke Detectors

Smoke detectors save lives. Unfortunately the radioactive material contained in ionizing detectors may also pose a threat to life There are two types of smoke detectors availabe for home use—ionizing and photoelectric. Many people are surprised to discover that ionizing detectors contain a radioactive substance, since manufacturers are not required to put the radiation symbol on the exterior casing or packing carton. The Canadian Atomic Energy Control Board (AECB) has determined that "it would not be appropriate-in fact it would be misleading-to place the radiation warning sign on anything other than the source housing itself [which is inside the detector]".

The radioactive substance americium ionizes the air within a chamber of the smoke detector, enabling the air to actually carry an electrical current between two electrodes. When smoke particles enter the chamber, the current is interrupted, thus triggering the alarm. By contrast, photoelectric detectors contain a light source, and a light-sensitive photocell that is not directly in line with the light. When smoke particles enter the detector, they scatter the light beam, and the photocell detects the reflected light. This process triggers the alarm.

According to tests by consumer groups, photoelectric detectors are more sensitive than the ionization type in their response to smoldering smoky fires which have larger smoke particles. 75% of fires within the home start as smoldering fires and account for most fire deaths. By contrast, ionizing detectors are faster at detecting the smaller smoke particles of open flame fires.

Ionizing detectors are effective for about ten years. The americium-241 that they contain continues to be radioactive for over 4,000 years. *(The* radioactive half-life of americium is 458 years). Americium, a bi-product of nuclear fission, is extremely toxic-americium is 53 times more radioactive by weight than plutonium 239. Americium emits alpha particles as well as low levels of gamma radiation. Unlike gamma rays, alpha particles cannot penetrate the skin, but they are highly carcinogenic (cancer causing) if inhaled into the lungs, otherwise ingested or imbeded in the skin. Ionising smoke detectors can contain upto five microcuries of americium-241. It has been estimated that one microcurie of americium-241, if evenly dispersed and inhaled has the potential to cause 78 lung cancers. The International Commission for Radiological Protection (ICRP) has set a maximum body burden for americium of 0.03 microcuries.

The large majority of the estimated 40-50 million detectors currently in use in North America are of the ionizing type.

Initially, The AECB required that all detectors containing radioactive material be disposed of in controlled waste areas. This is no longer the case. In 1978, an AECB review determined "that domestic smoke detectors thrown out with the regular garbage were not a concern with respect to the health and safety of the public or waste disposal workers." However, commercial smoke detectors, used in factories, schools and other large institutions, must still be discarded in an 'approved' method, as outlined by the AECB.

According to David Poch, author of Radiation Alert, "the greatest hazard occurs when the americium escapes due to fire, tampering or damage after disposal. If swallowed it accumulates in the liver, bone marrow and endocrine glands, with a corresponding risk of cancer". When we consider that the 40 to 50 million detectors currently in use are starting to accumulate in landfills, it can be seen that disposal is probably the single greatest problem with ionizing detectors. Many of these units may be burned in municipal incinerators, which will further exacerbate the situation.

in this case, for the 4,000 year lifetime of americium. Fortunately however, there is a clear alternative - buy a photoelectric detector instead of the ionizing type. Although it is more expensive, you will get a detector that is better at detecting the most dangerous fires, and you won't be contributing to the radioactive waste problem.

Principles of Ecology

Properly speaking, global thinking is not possible. Those who have "thought globally" (and among them the most successful have been imperial governments and multinational corporations) have done so by means of simplifications too extreme and oppressive to merit the name of thought. Global thinkers have been, and will be, dangerous people. National thinkers tend to be dangerous also; we now have national thinkers in the north-eastern United States who look upon Kentucky as a garbage dump. Global thinking can only be statistical. Its shallowness is exposed by the least intention to do something. Unless one is willing to be destructive on, a very large scale, one cannot do something except locally, in a small place. Global thinking can only do to the globe what a space satellite does to it: reduce it, make a bauble of it. Look at one *of* those photographs of half the Earth taken from outer space, and see if you recognize your neighbourhood If you want to see where you are, you will have to get out of your space vehicle, out of your car, off your horse, and walk over the ground. On foot you will find **that** the earth is satisfyingly **large, and full** of beguiling nooks and crannies.

If we could think locally, we would do far better than we are doing now. The right local ques-

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Ionising radiation as a toxic sagent differs fundamentally from toxic substances which can be introduced to a solution slowly and diluted to a lower and lower uniform concentration. By contrast for low energy transfer radiations such as X-rays and beta particals, the minimal unit is the primary ionisation track led by a single high speed electron. The electron cannot be subdivided and it cannot make its delivery of energy more gentle by diluting it evently throughout the whole cell—it is abrupt and very close to the primary track. For example, just one gamma ray photon of caesium-137 of 662 kev energy results in the dilivery of 79.2 millirad of dose to some 91 cells and this energy delivery is typical of that delivered by every microscopic high speed bullet from smoke detectors. The microdose of 0.00001 mSv or 0.001 millirad is delivered to the whole body and this includes many cells not traversed at all by the electron. And the track dose of 79.2 millirad is 79200 times the person dose, and would be the cause of fully competent carcinogenic lesion. There is no dose which would be safe for us from radiation-induced cancer. - Adapted from Goffman J.W. (1990). *Radiation-Induced Cancers from Low Dose Exposure: An Independent Analysis*

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are using, and its ecological limits, always in sight.

The only sustainable city—and this, to me, is the indispensable ideal and goal—is a city in balance with its countryside: a city, that is, that would live off the net ecological income of its supporting region, paying as it goes all its ecological and human debts.

The cities we now have are living off ecological principal, by economic assumptions that seem certain to destroy them. They do not live at home. They do not have their own supporting regions. They are out of balance with their supports, wherever on the globe their supports are.

The balance between city and countryside is destroyed by industrial machinery, "cheap" productivity in field and forest, and "cheap" transportation. Rome destroyed the balance with slave labour; we have destroyed it with "cheap" fossil-fuel industries.

Since the Second World War, the norms of productivity have been set by the fossil-fuel industries.

Geographically, the sources of the fossil fuel are rural. Technically, however, the production of these fuels is industrial and urban. The facts and integrities of local life, and the principle of community, are considered as little as possible, for to consider them would not be quickly profitable. Fossil fuels have always been produced at the expense of local ecosystems and of local human communities. The fossil-fuel economy is the industrial economy par excellence, and it assigns no value to local life, natural or human.

When the industrial principles exemplified in fossil-fuel production are applied to field and forest, the results are identical: local life, both natural and human, is destroyed.

Industrial procedures have been imposed on the countryside pretty much to the extent that country people have been seduced or forced into dependence on the money economy. By encouraging this dependence, corporations have increased their ability to rob the people of their property and their labour. The result is that a very small number of people now own all the usable property in the country, and workers are increasingly the hostages of their employers.

Our present "leaders"—the people of wealth and power—do not know what it means to take a place seriously: to think it worthy, for its own sake, of love and study and careful work. They cannot take any place seriously because they must be ready at any moment, by the terms of power and wealth in the modern world, to destroy any place.

Ecological good sense will be opposed by all the most powerful economic entities of our time, because ecological good sense requires the reduction or replacement of those entities. If ecological good sense is to prevail, it can do so only through the work and the will of the people and of the local communities.

For this task our currently prevailing assumptions about knowledge, informations, education, money, and political will are inadequate. All our institutions with which I am familiar have adopted the organizational patterns and the quantitative measures of the industrial corporations. Both sides of the ecological debate, perhaps as a consequence, are alarmingly abstract.

But abstraction, of course, is what is wrong. The evil of the industrial economy (capitalist or communist) is the abstractness inhereant in its procedures—its inability to distinguish one place or person or creature from another. William Blake saw this two hundred years ago. Anyone can see it now in almost any of our common tools and weapons.

Abstraction is the. enemy wherever it is found. The abstractions of sustainability can ruin the world just as surely as the abstractions of industrial economies. Local life may be as much endangered by "saving the planet" as by "conquering the world". Such a project calls for abstract purposes and central powers that cannot know, and so will destroy, the integrity of local nature and local community.

In order to make ecological good sense for the planet, you must make ecological good sense locally. You can't act locally by thinking globally. If you want to keep your local acts from destroying the globe, you must think locally.

No one can make ecological good sense for the planet. Everyone can make ecological good sense locally, if the affection, the scale, the knowledge, the tools, and the skills are right.

The right scale in work gives power to affection. When one works beyond the reach of one's love for the place one is working in, and for the things and creatures one is working with and among, then destruction inevitably results. An adequate local culture, among other things, keeps work within the reach of love.

The question before us, then, is an extremely difficult one: How do we begin to remake, or to make, a local culture that will preserve our part of the world while we use it? We are talking here not just about a kind of knowledge that involves affection but also about a kind of knowledge that comes from or with affectioin - knowledge that is unavailable to the unaffectionate, and that is unavailable to anyone as what is called information.

What, for a start, might be the economic result of local affection? We don't know. Moreover, we are probably never going to know in any way that would satisfy the average dean or corporate executive. The ways of love tend to be secretve and, even to the lovers themselves, somewhat inscrutable.

The real work of planet-saving will be small, humble, and humbling, and (insofar as it involves love) pleasing and rewarding. Its jobs will be too many to count, too many to report, too many to be publicly noticed or rewarded, too small to make anyone rich or famous.

The great obstacle may be not greed but the modern hankering after glamour. A lot of our smartest, most concerned people want to come up with a big solution to a big problem. I don't think that plantetsaving, if we take it seriously, can furnish employment to many such people.

Some cities can never be sustainable, because they do not have a countryside around them, or near them, from which they can be sustained. New York City cannot be made sustainable, nor can Phoenix. Some cities in Kentucky or the Midwest, on the other hand, might reasonably hope to become sustainable.

To make a sustainable city, one must begin somehow, and I think the beginning must be small and economic. A beginning could be made, for example, by increasing the amount of food bought from farmers in the local countryside by consumers in the city. As the food economy became more local, local farming would become more diverse; the farms would become smaller, more complex in structure, more productive; and some city people would be needed to work on the farms. Sooner or later, as a means of reducing expenses both ways, organic wastes from the city would go out to fertilize the farms of the supporting region; thus city people would have to assume an agricultural responsibility and would be properly motivated to do so both by the wish to have a supply of excellent food and by the fear of contaminating that supply. The increase of economic intimacy between a city and its sources would change minds (asuming, of course, that the minds in question would stay put long enough to be changed). It would improve minds. The locality, by becoming partly sustainable, would produce the thought it would need to become more sustainable.

Another Wicket Down

The Oldest Operating Reactor in US Faces Closure

The Board of Directors of Yankee Atomic has decided to close its Yankee Rowe reactor permanently rather than spend the money to repair or even to fully investigate its embrittled reactor vessel.

The board's decision followed a last ditch, and unsuccessful, utility effort to convince the Nuclear Regulatory Commission (NRC) to allow the reactor to operate for at least one more fuel cycle without modifying the vessel.

The Yankee Rowe reactor had a book value of only $28 million, and just determining the vessel's con dition was expected to cost about $23 million. If the vessel needed replacement or annealing, the costs could have risen to $ 100 million or more-clearly daunting numbers to the utility's board. And with no US precedent in this area, there was no guarantee that replacement of the vessel was either politically (because of potential worker exposures) or technically feasible, while annealing has not been tried in the US either.

The decision shook the nuclear industry, which just a year ago was touting Yankee Rowe as the ideal reactor to initiate the NRC's license renewal process. Its relatively good operating record, particularly given its status as the nation's oldest operating reactor, would help it lead the way towad a new generation of extended licenses Like a fine wine, the industry argued last year, Yankee Rowe improved with age.

In this case, however, the fine wine quickly turned to vinegar following an investigation of the plant by the Union of Concerned Scientists (UCS). The organization found that the condition of the reactor's pressure vessel could not be determined, and certainly did not meet NRC regulations. UCS and the New England Coalition on Nuclear Pollution filed a petition to close Yankee Rowe until its vessel clearly met the rules. After several months of hemming and haw ing and defending the plant, the NRC finally agreed with UCS last September and the utility "voluntarily" closed the plant rather than face an NRC shutdown order.

Ironically, the US Council for Energy Awareness (USCEA), the nuclear industry's public relations arm, currently has advertise ments running in major magazines promoting nuclear power with a photograph of Yankee Rowe in a pastoral forest setting. Perhaps realizing the inevitable outcome, CEA "Whited out" the Yankee Rowe nameplate in front of the plant.

Northern States Power's Monti cello reactor now becomes the lead industry plant for license renewal An application for renewal is expected to be submitted sometime this year. As a highly controversial GE Mark 1 design, (the same de sign as Tarapur-Editor) which many nuclear experts believe never should have been built in the first place, Monticello can expect a thorough examination of its technical condition and basic design. If the Yankee Rowe experience is any indication, Northern States can expect anything but smooth sailing in the renewal process.

In fact, given Yankee Rowe and last month's agreement to close the aging San Onofre-1 reactor rather than spend millions on modifications, it appears that closing older reactors rather than up grading them makes sense for ratepayers and utilities alike,

A New Pair of Crutches

In a remarkable perversion of the concept of "free enterprise", the US Department of Energy has agreed to pay half the costs of developing non "advanced", non-" meltdown proof new reactor designs for three of the nation's largest corporations. The designs include General Electric's Advanced Boiling

Water Reactor and Simplified Boiling Water Reactor, Westinghouse's AP 600 Pressurized Water Reactor and ABB- Combustion Engineering's System 80 Pressurized Water Reactor. Actually, the ABB-Combustion Engineering is not even a US design, since primary owner ABB (Asea-Brown-Boveri) is a Swedish company. ABB has also been implicated in the diversion of nuclear technology to Iraq. All of the designs are light-water reactors, and are merely updates of existing designs. None meet the "meltdown-proof criteria often advanced as a prerequisite for new reactor construction.

The initial phase of the contract is expected to be $200 million over five years. The DOE decision came about because, according to Assistant Secretary for Nuclear Energy, William Young, "...the industry made it clear that without cooperation with the government, the industry would not be able to do the development work required to make available the next generation of light water reactors". Apparently the DOE did not consider that if the industry doesn't think it would be profitable to develop these new reactor designs, then perhaps the taxpayers wouldn't think so either.

The Nuclear Monitor
March 9,1992

Heavy Going For Heavy Water Board

The production figures at the end of the financial year flowing into the heavy water board offices at Trombay reveal that with only 273 tonnes of heavy water produced during the last year, the Department of Atomic Energy (DAE) is over two-thirds short of its target.

Coded confidential dispatches to the board from each of the eight heavy water plants scattered around the country also show that, at crores of rupees per tonne of heavy water produced, the DAE must be running one of the world'ss most expensive heavy water programme.

For example, when the Manuguru heavy water plant at Andhra Pradesh was commissioned in December last year, over Rs 650 crores had been spent on it, and it was already nearly four years behind schedule. Begining last April, when it generated about 100 kg of heavy water, the Manuguru plant has, until February this year, produced only about 35 tonnes of its full capacity of 185 tonnes per year. Each tonne thus costs about Rs 19 crores.

Yet, speaking to this newspaper yesterday, the secretary of the DAE, and the chairman of the Atomic Energy Commission (AEC), Dr P.K. Iyengar, stated that during the last two weeks, "The plant has been functioning up to 85 percent of its capacity. Ofcourse, this varies depending upon the pressure."

More shoking than Manuguru is the state of the Talcher plant. Ever since it was commissioned in 1984, it has not generated more than about 10 tonnes of heavy water. Its scheduled capacity is stated to be 62 tonnes per year, and even that is derated from the original 67; thus the Talcher plant has generated till February this year, only about 3 per cent of the amount of heavy water it should have produced by now. Not far better is the condition of any other of the heavy water board's plants. The most efficient is Tuticorin, operating at about 84 per cent. During the year from April 1991 to February 1992, this plant generated about 41 tonnes of the precious fluid, as against its capacity of 49 tonnes.

Also among the star perfofmers, with an efficiency factor of 75 per cent, thanks principally to the fact of having been derated over time from a capacity of 14 tonnes annually to one of about 8 tonnes today, is Nangal in Punjab, the country,s oldest plant, put up in 1962.

"The country's first drop of heavy water was manufactured there," according to board officials, and making use of the supposedly most expensive "water-hydrogen sulphide" technique, Nangal has produced during the last year, from April to February, just under six tonnes of heavy water.

Next in the league table with an efficiency factor of 67 percent is Kota, which during the year, generated about 57 tonnes, as against 85. Hazira follows, with a 60 per cent efficiency. Next comes Baroda (44 per cent) followed by Thal (43 per cent), with Manuguru next and Talchar last.

Work on Manuguru began in 1982, and was scheduled for completion in five years. Had it been commissioned On schedule, it would have by now produced 740 tonnes of heavy water. Instead it has managed just five per cent of that amount.

At a recent seminar at Trombay, the heavy water board's cheif execcutive, Mr. G.M. Sundaram, bent over to touch Dr. P.K. Iyengar's feet, under the astonished gaze of scores of heavy water board engineers and scientists.

During the last year, the former general manager of the Manuguru plant, Mr Mohinder Singh, pointed out a number of financial irregularities in the functioning of the plant, and recommended an enquiry into them. However, he was simply shifted to the board's office in Bombay, and nothing further was done.

Mr Singh has inferred, in a July 1991 letter to Dr Iyengar, that the executive direcctor in charge of Manuguru, Mr. S. Sharma had taken a decision to order 16 different kinds of tests on the transformer oil being used at Manuguru in the face of advice from juniors that all but a quarter of these tests were of no practical value, and essentially academic.

It further emerged that the company which had been contracted to do the job at nearly Rs 9 lakhs, Esquire Engineers and Consultants of Madras, had no facilities to do it, and was simply farming oil samples out to government-run laboratories for testing. All this inspite of the fact that test facilities existed at Manuguru itself.

"We can save time and money by collecting the samples and sending them to either Bangalore or Hyderabad for test results. Under the circumstances, it is considered that giving oil samples to Esquire is not at all economical," Mr Mohinder Singh says, in his letter to Mr. Sundaram, a copy of which was sent to Dr Iyengar.

Totally. 11 different kinds of corrupt practices are detailed, and an inquiry recommended into them. Among these is a case of overpayment to a Calcutta firm to the extent of Rs 4 lakhs, which is described as "being not an isolated case^{0}.

Speaking to this newspaper, Dr Iyengar said that he was unaware of the specific details of the alleged irregularities. Subsequently he stated that he had asked the board cheif executive, Mr Sundaram, to look into them, and was satisfied that they were baseless.

Dr Iyengar estimates that 250 tonnes of heavy water are needed to run each nuclear reactor. But last year the whole complex heavy water manufacturing structure has generated only enough to run just one nuclear reactor

Clarence Fernandez
Times of India
March 3, 1992

Letter Box

The cycle yatra from Gujarat to Kerala to commemorate Chernobyl day is very timely and important,

Inspite of efforts like this from people's groups the government is not paying any attention to the fact that nuclear power is dangerous to our nation. When they do not learn from others' experience then maybe they will learn by some terrible blow."

Kantilal Yora, *Ahmedabad.*

Like the Anumukti issue Vol.5,No.2, you are running arround and working hard for analysing the Rawatbhata Survey results. Doctors went to Khetpalia village recently and did a check up and distributed medicines to the sick people. People are awaiting eagerly for Rawatbhata Survey *report* Our students learnt a lot during the survey. It was an enriching experience for them."

Rampratap Gupta
Rampura,

"We were caught up with helping with the Narmada Bachao Andolan's programme, so I could not reply right away. About 350 people from the valley were here for 2 days along with Medha and other activists. It was a hectic time but worth it Besides other things, they wanted to draw attention to the eviction notice for Manibeli,. the last date being 31st January. Some of the villagers also returned their "pattas"/papers to the State revenue minister stating that they would join the others in their stand of not vacating their lands under any condition. A dialogue between the government and the Anodlan, and a demand that the project be reviewed was made.

Some of us from Bombay have initiated a restructuring of the Andolan's Bombay support groups working. The process is in full swing right now. We are pushing for a greater participation of people, since there are many potential participants (they just need to feel welcome and be encouraged)

Furthermore, such movements also need to develop a wider orientation considering the problems of sustainability, and the faulty pattern of development -so as to lend and share support to other similar groups like yours in a more active manner-to finally develop ONE united front. What do you think? Your comments would be valuable, because you both *truly* live and understand these concepts.

The Cycle Yatra 'Bombay part mainly) may be one of the initial testing grounds to see how this kind of "widening" process can lend support 1 must emphasize here that though things are happening, the above thoughts are my personal perceptions coupled with positive thinking. 1 think others share them too."

Mona Patrao, Bombay

In Goa the last of our beautiful beaches are going to be invaded by big projects.. For example, the Japanese intend to build villages on our soil for their old. Age old settlements of people are going to be deprived of their grazing grounds, free access to the beach, fruit, fuel and foliage of the hill slopes, scarce water resource and huge chunks of precious land The rapid urbanisation, and influx of people further disrupts the way of life of the people and our unique ecology. All this at tremendous financial cost to us by way of incentives, subsidies, cheap land, water, electricity and cheaper labour.

What do you think we should do as follow up to the Consultation on Tourism in Goa? Is it possible to stall this international juggernaut? Let's have your thoughts."

Gemma de Sa
Goa

"Irfan Engineer has been workiug among Dang tribals for quite sometime. He organised them and fought for their long-standing demands forcing the Government of Gujarat to give **a** serious thought to tribals' demands. However, the corrupt forest officials were waiting for an opportunity to take revenge.

On 2nd January, 1992 Irfan and Virsingh tribals sat on indefinite fast demanding compensation for Tarabai who was killed when the tribals were agitaing *for* their demands and police opened fire. Also, the fast was undertaken to demand arrest of those forest officers who asked police to fire without any reason.

On 9th January, 1992 the Gujarat police arrested Irfan and Virsingh under NSA and put them in Baroda Central Jail. Undertaking indefinite fast is a perfectly legitimate democratic method. There cannot be a more peaceful protest than this and yet they have been arested under NSA. One fails to understand how NSA can be applied in such case. It is gross misuse of NSA.

May I, therefore, request you to kindly protest against this high-handed behaviour by sending telegrams to Home Minister Shri. S.B.Chavan and Chief Minister of Gujarat Shri.Chimanbhai Patel. You may also write to Irfan Engineer, C/o.Superindendent of Baroda Central Jail, Baroda, Gujarat."

Asgharali Engineer
Bombay

"My suggestion to you during the cycle yatra would be to keep in touch with grassroot groups, so that the movement grows instead of just organising workshops and allowing people like Narayanbhai to come and lecture. The yatra participants' sharing will be much much more effective and give a boost to the movement."

Nicky Cardoza
Bombay

"I have gone through the details of Cycle Yatra organised by Sampoorna Kranti Vidyalaya to commemorate the Chernobyl Day. I am sending my good wishes to this programme."

Babubhai Jasbhai Patel
Gandhinagar.

I have gone through all the news and articles on health effects of Rawatbhata nuclear power plant on the people of surrounding villages. I am sorry that I can't participate directly but kindly accept the monetary contribution as my support effort."

Dr.Mihirbhai Joshi
Visnagar

Unfortunately I am unable to join the Cycle Yatra because of organisational responsibilities. I am sending my suggestions for the Cycle Yatra. (1) Always keep some food with you. (2) Have water bags for everyone (3) Keep addresses of young people you meet on the Yatra for follow up actions (4) Keep materials to write slogans on the walls and rood."

Bhagyadhar Baij
Orissa.

"**I** am working with Sarvodaya drought relief commettee, Orissa. I would have very much liked to participate but the committee has not given me permission. Would you request them to let me go,"

Pramod Mudali,
Orissa.

"We feel that if you had planned it with some more advance notice, it would have been possible to plan the yatra more effectively and have greater participation. This was based on the experience in the two previous yatras, viz. the Save the Western Ghats March (SWGM) during November 1,1987 to January 30,1988 and the Kanyakumari March during April 2 to April 30, 1989 and both of these were coordinated by the Samaj Parivartana Samudaya at the Karnataka State level with the active cooperation of various other voluntary groups especially the Federation of Voluntary Organisation for Rural Development in Karnataka (FEVORD-K). We have appreciated your open invitation to make yatra our own and help in whatever way possible."

S.R.Hiremath,
Janvikas Andolan, Karnataka..

Subscription Rates:

Rs 25/- per year South Asia
U.S. $15/- or equivalent in other convertible currenencis (airmail overseas)
(Rs.300/-per year if paid for in India)
Rs 250/- for life (only within India)
Please add Rs 6/- for cheques
Drafts should be drawn on State Bank of India, Valod (code no 0531)
Editor: Surendra Gadekar
Subscriptions, donations, manuscripts, inquiries regarding circulation, etc., should be addressed to:
Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat 394641 INDIA
Published by S. Gadekar for Sampoorna Kranti Vidyalaya, and printed at Meghna Arts, Bombay.

PRINTED MATTER BOOK POST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

volume 5 Number 5 April/May 1992

Analysis

Some Problems and Prospects Facing the Antinuclear Movement

It is doubtful whether an antinuclear "movement" worth the name has so far evolved in India; yet there are groups taking up nuclear issues all over the country. These are mostly middle-class oriented city groups. The poorer classes on the other hand, have not participated in the work of these groups. Therefore, antinuclear groups always face a dearth of activists to continue their work persistently.

There have been ups and downs in each antinuclear upheaval in the country. Due to constraints of men and material there has not been any continuous or sustained work in most cases. To keep people active, there is a need for programmes. Most groups have limitations that they have not been able to overcome successfully. Financial constraints have crippled many a group that could have put in commendable work. The apolitical nature of the antinuclear groups and their general indifference to pressing problems like price rise and increasing unemployment have made mainstream political parties sceptical of them. The masses generally share this scepticism about antinuclear and environmental groups. They have no faith in many of these groups, as these are not addressing directly felt needs like the drinking water problem and are not suggesting workable solutions. Lack of information and the consequent inability to counter effectively certain apparently pertinent points raised by the government, the pronuclear antienvironmental lobby, and a section of the press, cast a few activists in a bad light in the eyes of the public Activists suffer due to the lack of effective communication among themselves; on the other hand, the media has let loose a propaganda blits for anti-people programmes in the name of "progress" and *"development"*

Problems with special reference to Kerala

Though economically a poor state and industrially not well-developed, Kerala has achieved a level of literacy and health status comparable to those of a few developed countries. This in turn has promoted a kind of consumerist, urban middle-class culture throughout the sate. It is a veritable sellers market for all consumer {pods, and people's life style has been considerably affected and influenced by the flood of manufactured goods. Therefore, any call to change the present life style will fall on deaf ears. "We cannot turn the clock back" people say, and activists are viewed with suspicion.

The people of Kerala are highly politically concious and they are all affiliated to one party or the other. All mainstream parties have unfortunately a concept of development which is similar to that propagated by the World Bank and the International Monetory Fund. According to that concept, nuclear plants mean more electricity; more electricity means more industry; more industry means mora employment. To the people of the state which faces acute unemployment problems Especially among the educated, any scope for employment is quite appealing and irresistable, despite all the attendant occupational hazards and environmental pollution. This is the rationale behind the Deration of Indian Rare Earths (IRE) and other hazardous and energy intensive industries in the state. It is an arduous task to convince the people that the present sort of "development" cannot solve the problem of unemployment or for that matter any problem Mass print media causes a great deal of damage by dubbing those who oppose the present mode of development as "anti-national" and "anti-people". In Kerala, where everybody is addicted to the daily newspaper and tends to believe the printed word, activists need to be extra-careful to avoid being misunderstood.

There are differing perspectives among environmental groups themselves. Some take extreme "fundamentalist" and "purist" stances, which do not appeal to the people at all. Certain groups vehementaly oppose dams and deforestation, but are rather lukewarm on the nuclear issue. There is no common shared perspective or an integrated approach towards alternative modes of development. Consequently, many groups oppose particular projects with sectarian and regional biases. The antinuclear group of Bhoothatthankettu in Southern Kerala, for example, is not opposed to a nuclear plant coming up anywhere else.

Various groups cultivate a sort of personality cult, and certain persons are projected as "heroes". These people think they are infallible and they sit in judgement on others. There is a lot of destructive criticism spewed out by such groups. These groups themselves do nothing, but simply create the impression that they are doing something by their public relations exercises in the press and the media. People who are earnestly doing something, and devote much of their time to antinuclear work, get disgusted with these self-advertisers and are in fact ashamed to be seen by the public as one among3t these so-called "activists".

People at large are confronted daily with innumerable problems like unemployment and rising prices of essentials. The structural adjustment programme has inflicted on them innumerable burdens in quick succession. They are not able to cope with the speed with which these economic measures are being implemented. They are shocked and paralyzed to such an extent that they cannot divert their attention to anything else. A general apathy and indifference to environmental issues exists as many think that these problems are not their concern; they think that is for the scientists or the government or the "movement" to take care of these issues. However, this attitude is changing, though slowly. Many champions of the antinuclear cause, though they are active in various cultural, literary and other social activities, are not so deeply committed to the nuclear issue that they can get involved in struggles. They are reluctant to work among ordinary people; as "stars" they stand aloof. People in turn suspect their motives. There is a credibility crisis. When a political leader with a past record of struggle and sacrifice, says something, even if it is utter nonsense, people tend to believe it; while they are sceptical of these stars who are not prepared for any sacrifice at all and who do not get directly involved in organising people

Raising financial resources is a formidable problem in the state. People will give money when there is a live political issue. At other times the movement has to be kept alive with meagre contributions. Often the workers face extreme hardship.

In any group there are only a few who work with deep conviction. They have to do everything. Added to this when money becomes a pressing problem, many workers feel helpless and slowly withdraw from the movement.

Though these are the problems, the experience with the movement against the Peringome nuclear power plant illustrates that one need not lose hope at all. Peringome demonstrates clearly that:

A sustained struggle is possible, if a group Is determined to go ahead with the work, and like-minded, groups support it. People can gradually get a perspective of our wrong mode of development. Even monolithic political parties will be compelled to review and readjust their positions when they find that people are really concerned about the nuclear issue and are prepared to fight against the power plant at all costs. People matter the most: if they put up a united struggle sinking all differences, no government in power can ignore it.

The struggles should not be seen in isolation but need to be placed in the global political context. The antinuclear issue, for example is a powerful political issue in the sense that it gives scope for exposing the strong neo-colonial interests dictated by the IMF and the World Bank, the interests of multinationals, and of the "new world order" which among other things aims at dumping hazardous industries and wastes in the Third World. Export of nuclear technology to Third World countries needs to be seen in the proper political perspective and people need to be convinced of the irrevocability of the mega hazards in all spheres — economic, political and ecological. Viable alternatives to nuclear power need to be demonstrated. It is strategically important in winning the support of people who want to continue their consumption patterns and at the same time want to be converted to an antinuclear position.

K.Ramachandran
Indivaram, Payyanur, Kannur

***April/May
1992***

Anumukti Cycle Yatra

The crowning moment of the cycle yatra for me came unexpectedly when it was already all over. We had received a hero's welcome in Payyanur and in Peringome. The two day convention of antinuclear activists called at Peringome had ended. We had sold our bicycles and were all set to go home. Manoj, one of the fulltime participants in the cycle yatra, invited us to visit his home at Taliparambha, a small taluka town some twenty kilometres from Payyanur. We had travelled in a bus and after the lovely cycling it all felt both strange and a bit distasteful. We got down at the bus stop in Taliparambha and were about to proceed to Manoj's house. He asked us to wait for a while, so that he could buy a few provisions before the twenty of us would descend unexpectedly on his parents. As we were waiting at the bus stop, there were curious glances from onlookers. We were no doubt a strange sight - our dresses had antinuclear slogans painted on them. And then, suddenly, things started falling into place. We started singing:

Uru uru ser beku
Oggatu aag beku
Anu Sthavara Nilessa bekanna...

(Come, come and get together
People need to unite together
We don't need nuclear power plants)

Suddenly we were all singing and dancing and there was a crowd of around two to three hundred people watching us. And some from the group were distributing leaflets, selling books and copies of *Anumukti,* and somebody had taken a hat around and made a collection. We were unfortunately not carrying our megaphone at the time. But, that lapse made no real difference. We gave speeches, sang songs, danced a little more. At that moment, I knew that what one really needs in a cycle yatra are not cyclists or even cycles but a group of people who act like a team and who are trained to communicate. And finally at the end of our journey, we were a team.

The Group

We had started some five and a half weeks previously, a mixed group: there were five (four boys and a girl) adivasi youth from villages around Kakrapar; there were the three students of Sampoorna Kranti Vidyalaya, (one each from U.P., Orissa, and Kerala); there were two who had taken leave from their jobs in Ahemdabad and had come; one had come specially for the yatra all the way from Kerala because he felt that if people from Gujarat could come to protest against a plant in Kerala, he could certainly do the same; and there were five from the staff of the Sampoorna Kranti Vidyalaya and there was my young daughter. Twelve of us were on cycles, two on a motor cycle and the rest were accompanying travelling in buses. However, till the Gujarat border, our hosts on the way sent us some vehicle, usually a jeep or a car. As we proceeded, some had to drop out and return to the real world but others joined in the way.

Two actiivists got married in Delhi on the 10th of April and departed for Goa on the 11th to join us there. Even a horse representing the entire non-human animal kingdom joined us for a short while in Ankola (he found the heat overpowering); Bharat was at two and a half the youngest member of the yatra. He joined us from Honnavar. Many joined us for the last two days in Kerala and in Peringome there were more than a thousand people for the final stretch.

The Route

Our route took us through some really beautiful and breathtakingly oceanic parts of the country. We started from Vedchhi and then travelled southwestwards through Vansda and Dharampur to meet the sea at Daman. After that, all along the route, the sea was our constant oompanian. So, for the most parts were hills of the Western Ghats and jungles From Daman our route took us to Tarapur and then on to Bombay where we staved for three days. Then, through Panvel and Pen up to Mangaon, on Highway 17. Then we took a diversion and got off the highway and went through Ambet and Mandangarh to Dapoli. From there on to Ratnagiri, Malvan and Vengurla before entering Goa in Pedne. We stayed four days in Goa travelling not directly southwards down the coast but visiting various groups in Mapusa, Panjim, Madgao, Ponda and Cancon areas. We entered Karnataka at Karwar and then took a detour to Kaiga. There we took two days off our cycles and travelled in a bus and a truck to Yellapur, Sirsi, the Bedthi dam site and other places in the hills before returning to our cycles at Ankola. From then via Kumta, Honnavar, Bhatkal, Baindoor to Udupi, Mulki and Mangalore. Kerala was our destination and all along the route we had kept chanting.

Kahan chale bhai kahan chale?
Gujarat se Kerala chale

We entered Kerala at Thalicheri and stayed one night at Kasargod and the next at Payyanur. The yatra culminated at the proposed nuclear power plant site at Peringome.

It was a cycle yatra where half the yatris fell sea-sick! There were a lot of ferry crossings and the one near Vijaydurg involved crossing the open sea.

The route was sceanic no doubt, but it was also full of ups and downs. At times, this could be quite tiring. Though coming downhill at great speeds was an exhilerating and a not to be missed on any account kind of experience, but then it was soon invariably followed by climbing steep slopes pushing the cycle. This, especially in the hot Sun was not something to be cherished, though I feel that it is the memory of such climbs especially the ones on the road between Malvan and Vengurla which would remain with me for a long time.

Ups and Downs

Our mood too like the road during the yatra, was sometimes way up and sometimes deep down. There were times when people fell ill Bachhi Singh fell from his cycle while going downhill at great speed near Ambet and had to have stiches. Vinayak slipped and fell on the road in a crowded street near Borivali in Bombay and then I collided with him. He was bleeding profusely and just then a person came up to me and started arguing that the cycle yatra was not in the national interest since it was against development! But the hardest part of the journey was not the physical hardship involved but rather the stresses and strains of group dynamics: Of people in the group, oneself included, being selfish and not acting in the best interest of the group. There were times when some dirty linen got washed in public. But then there were the highs—moments of pure ecstasy which one would not miss for anything in the world—moments of inspiration.

The most exhausting and trying day of the cycle yatra came early on. We had entered Maharashtra and spent the night at Dahanu. Originally, our schedule was to have the night halt at Chinchani—a small village just two kilometres from the Tarapur Atomic Power Station. However, local hhosts had made some changes and Anand, our local organiser, was to meet us at Boisar railway station at Ten O'clock in the morning.

Wo started from Dahanu at 5.30 in the morning and proceeded to Chinchani. The morning air was cool and we made good progress. Reached Chinchani in time for breakfast and distributed a lot of leaflets. From Chinchani we went to Boisar via Tarapur, shouting slogans most of the way especially when we spied some power station vehicle. We reached Boisar station in time to meet the morning train which brings nuclear workers and had a well attended street meeting. Anand met us and he informed us that our night halt was at a village called Nandakhal, which was another eighty-five kms distant. We had already covered around forty five kms till then in the morning. His suggestion was that we should all go in a train up to Virar and then go further on cycles. However, these were early days of the yatra and none of the yatris were willing to even consider this proposal. Instead, we asked around if there was a short-cut, and somebody suggested an alternate route over a new bridge which had been constructed over the Par creek. He claimed that this route would save around 30 kms. Of course, the tourist map of Maharashtra that we had was totally useless in this situation. All of us were game for this plan and so alter a quick lunch at Palghar we were off, braving the hot noon sun. A little distance down the road, Manoj felt sick and started vomiting. So, we rested for a while in a small village on the verandah of a house by the side of the road. The women of the house were very hospitable and offered us tea and we talked about the problems caused by industrial pollution, salt pans and especially radioactive pollution from Tarapur. We left alter Manoj felt a little better and was able to ride pillion on the motor-cycle, while Uma took his cycle.

Soon alter leaving Safale, we had an unpleasant surprise in store. The road started climbing and a huge hill loomed ahead. None of our guides had even whispered a word about the road being hilly. We went up and then down again alter enjoying the fantastic view and crossed the bridge on the Par creek. And then our problems began. There was a small mud track going south, while the tar road that we had been travelling on, turned northwards opposite to the direction of our destination. We asked a lot of people directions, but they were all unanimous in recommending the tar road. The mud track they claimed did not go anywhere. The highway is just some ten kms away and you will have to catch that There is no other way." Well, we cycled on, but after cycling well more than ten kms, there was still no sign of the promised highway. The site, just then of a small canal by the side of the road was like nectar to our eyes. We all waded in and had a most refreshing bath and were ready to face the road once more. "How far is the highway", we asked. "Oh, just another ten kms," was the entirely predictable answer.

By the time we reached the highway, it was dark already, and all of us were ready to drop off. Virar-naka was another seventeen kms down the highway we learnt. We were wondering what to do, with most of us in favour of spending the night beside the road, when suddenly a truck stopped and out stepped Anand. "Your food is all ready and waiting for you at Nandakhal," he said. Now there was no opposition at all to the suggestion that the cycles be loaded on to a truck and we all go to Virar-naka. The problem was how to get a truck to stop and listen to our proposition.

We walked to a dhaba some hundred yards down the road and explained our plight to the owner, who happened to be a Sardarji. "No problem at all," he said. "I will see that you set there. He talked to two truck drivers who had retired there for the night and miraculously we were all loaded and off within a few minutes. To top it all these friends refused any payment on reaching the destination saying that it was their *duty* to help fellow travellers, and sppecially those like us who were on a mission.

But the adventures of the day were not yet over. Nandakhal turned out to be another seventeen kms from Virar naka. Five people declared that they could not cycle any more and decided to call it a day right there, while the rest of us proceeded further. It was ten at night and this area it seems is not

not considered very safe, due to the acivities of smuggler gangs. Five miles down the road, we came upon a road-block and found to ur joy, a jeep there belonging to our hosts—the Harit Vasal group. One friend Joined us to show us the way, while the jeep went to Virarnaka to collect all those sleeping there and bring them to Nandakhal. By the time all of us reached our destination and ate the much awaited meal, it was past midnight.

The day had certainly toughened us. Later on, once we had to cycle 93 kms in a day over hilly roads, but that felt like child's play. But what really touched us was the unstinted help of those unknown Sardarjis and the wonderful hospitality of the Harit Vasai group. It was such experiences which are the most cherished memories of the yatra.

Himalayan Blunder

The biggest blunder of the yatra was of our own doing. We had given very short notice of the whole programme and that had given very little time to local organisers to make arrangements. Thus, there was an air of uncertainty regarding the route of the yatra right till our departure since we did not receive any word from the people who were to be our hosts. Despite the short notice, the arrangements for our stay and the food almost everywhere were excellent. This fact bears testimony to the magnificent effort put up by our local hosts.

Only once did we have to fend for ourselves. This happened in Sindhudurg district. According to our schedule we were supposed to have a night-halt at a place named Meethbav, where the Sarpanch had been informed of our impending arrival. Meethbav was ten kms off our track. When Uma and Suren Raut who were the advance party on a motorcycle arrived there they found that there were no arrangements for our stay. The Sarpanch had considered his duty just lay in writings notice regarding a meeting in the town square, and he said that the village had no facilities for accomodating fifteen persons. At that, Uma and Suren hurried back to stop the rest before the detour. In passing, Uma noticed a Mahadev temple at a village named Dahibav. She went in and asked the old pujari there if the whole party could put up there for the night. Without a moment's hesitation and without even asking for the total number, he answered, "Of course." And he further added, "Would you be able to cook for yourselves if I get you food and utensils?" But as we were eating we found that he had another unexpected surprise in store for us. A lot of the young men of the village gathered at the temple. So after dinner we had a slide show and a fine lively meeting as well.

Picture of Devastation

Talking to the villagers in Dahibav we found that this village was indeed exceptional—it did not have water problem whereas all the other villages in the vicinity were suffering from a severe water crisis. Even in my own ancestral home in Vengurla, which I visited for the second time in my life after a gap of thirty-two years, wells had run dry. All along the Konkan coast the sight of women walking large distances up hill and down dale to fetch a pail of water has become distressingly common. This, in an area which registers over hundred inches of rainfall every year, is an absolutely shocking state of affairs.

In fact, the whole cycle yatra was an object lesson in the after effects of this madness known as development. Hill sides in Konkan lay barren with hill tops presenting a desert like appearance. But deforestation and water shortages are not the only problems affecting the region. Industrial pollution and toxic waste dumping in water ways has made some rivers stagnant looking, foul smelling stench pools. The condition of Kolak river on the border of Gujarat with Daman is too appaling for words. Industrial pollution from Vapi has made this once rich fish breeding ground into a totally lifeless stream of some dirty viscous fluid. The villagers of Kolak came ten kms to meet us and to tell us about their plight. A lot of local fisherwomen have fallen ill with cancer of the pelvis, they claimed. Patalganga was another seriously contaminated stream. The culprit in this case was a chemical plant belonging to Reliance Industries. But all along the northern part of the route there were many operating and proposed agro-chemical complexes. The southern part of the route has a multiplicity of nuclear installations!

We had some very good meetings with people in villages which have been targeted as sites for chemical complexes. Everywhere one question dominated. How can we organize ourselves effectively to stop this monster coming in our area?

The dominant impression left on my mind from the yutra is one where the bull-dozer of development in riding roughshod over the picture-book pretty landscape. This impression is probably heightened because there wore a row of bulldozers and trucks all systematically tearing apart a hillside for the Konkan Railway project. Even this project, which could easily be implemented after consultation with the effected people and with their consent is sought to be implemented in a way where a large number of Christians in Goa feel that the railway is a disguised attempt to destroy their faith by destroying old churches and monuments.

A Tale of Two Cities

I will never forget the public meeting in Ratnagiri-the home of Bal Gangndhar Tilak and many other leaders of the freedom struggle. Our local organiser had booked a hall and made announcements in all the local papers. We went to the hall a little ahead of time and waited for the audience to come. We waited and waited. Not a soul appeared. Finally, after nearly an hour, a man came. We all almost jumped on him hoping to 'convert' at least one person. But he had just come to inform us to vacate the premises since they were needed for another programme. We left. Just outside the hall, a little distance away was the main bus station. Aradhana started talking on the megaphone and soon there was a crowd of two hundred listening and asking questions and buying our literature. We did six such separate meetings in the course of the next two hours, and learnt a valuable lesson in the bargain. The energy spent in arranging public meetings with its microphones and chairs and tables and flowerpots is better spent doing street actions which are watched by far more and where there is more active participation.

But on the other hand, the public meeting in Bombaywas a very lively affair with a lot of people asking questions, expressing opinions and making promises of future involvement. The limitation of the street meeting is that there is no possibility of follow-up. And that is a very severe limitation indeed and a well arranged meeting like the one in Bombay is a reminder of this. The credit for the success of the Bombay meeting goes mainly to Mona Patrao and other members of the Anumukti Support Group which had been formed with a view to coordinating the Bombay programme of the cycle yatra.

A Kaliedoscope of Changing Patterns

Every state boundary meant a new set of friends and a new pattern of organisation which was absolutely fascinating to watch. Different state groups had reacted to the possibilities presented by the yatra in different ways. Thus, for example, the Karnataka group had decided to utilize the yatra as an attempt to revitalize the Kaiga movement. In their preparation, some activists went and visited each and every village that they had previously contacted during the Save the Western Ghats March. Bailancho Saad in Goa, on the other hand decided to involve a lot of new groups and individuals who had previously been unexposed to antinuclear ideas. The Kerala activists on their part had focussed their efforts on people's participation and the huge crowds that greeted the yatra in Kerala were a tribute to their organizing skills.

Our hosts and supporters reflected the great cultural, religous and even ideological diversity of our country. Thus from R.S.S. and Shiv Sena to Gandhians, Socialists, Communists and Naxalites all hosted us and joined us. Rich chicu and supari planters took us in their homes, but then so also did many poor families. We stayed in Hindu mutts but then we also stayed in Christian churches.

But the real success of the yatra would depend mainly on how this upsurge in feeling can be channeled into a movement of continuing activity. On our part, we intend to organise both local level and all India level antinuclear camps at Vedchhi, during the coming year.

The finest tribute to the spirit of the cycle yatra came in Bhatkal. We had done a street play and talked and most of us had already left for our next destination. Dr Kusuma had stayed behind showing the Rawatbhata slides. A beggar woman with a mentally handicapped child who was watching the slide-show went around and collected a few Rupees and handed over this money saying, "you are working so that no mother in the world has to suffer like I have had to suffer." The antinuclear movement in India cannot afford to fail her.

Surendra Gadekar

An Advertisement

Sampoorna Kranti Vidyalaya invites applications from young men and women to a new course, beginning from August 24, 1992. Applications can be obtained by sending a self addressed stamped envelop to:

Long Term Course
Sampoorna Kranti Vidyalaya
Vedchhi via Valod
District Surat 394641

The vidyalaya has facilities and funds to train around fifteen students during the next year. There is no fixed curriculum, but each student devises his/her own curriculum in consultation with the staff. Anybody satisfying the following four conditions can become p. student of the vidyalaya:

- He/she must come of his/her own choice and not be sent unwillingly
- Should have faith in non-violence
- Should be willing to do manual work. All work in the vidyalaya is done by the staff and students together.
- A minimal knowledge of Hindi and failing that at least a willingness to learn the language which is the language of communication in the vidyalaya.

The vidyalaya bears all the lodging and boarding expenses of the students during their stay. It does not bear travelling expenses incurred in travelling to and from the vidyalaya.

The long term course attempts to not only impart information and skills but most importantly it tries to develop attitudes so that the trainees can become agents of a non-violent, non-exploitative society. A lot of remarkable people, who are actively engaged in movements for an alternative society, and in peace and justice issues, visit the vidyalaya, and students get ample opportunity to learn from them. But the greatest asset the vidyalaya possesses is that it considers life itself as the best teacher and thus all experiences in community living are seen and utilised as learning opportunities.

Human Right to Radiation Security

In 1948, when the Universal declaration of Human Rights was adopted by the UN General Assembly, nobody in the world was fully aware how radiation was dangerous to human beings. Today, having experienced the Chernobyl catastrophe, all people of good will realize the danger of radiation. It creates a threat to the very existence of mankind, human health and gene funds. The earth has already got 15 wounds caused by radiation, that cannot be healed, Chernobyl being the most terrible among them. The victims of these tragic events have been and are common peaceful people. Social efforts to reduce the damage caused by radiation are uncoordinated and weak. The efforts put forth by states and governments are also inadequate. International Atomic Energy Agency (IAEA), the sole international organisation dealing with atomic energy, concentrates its activities on control over military projects and maintaining the minimum safety standards for the workers of atomic energy industries. IAEA objectively cannot protect the interests of the people who are suffering, and in fact, it does not. Therefore, we have nothing at all to protect ourselves from the menace of radiation. This situation is getting worse due to some more factors. One of them is psychological. Since human sense organs cannot detect radiation, people do not realize its danger. The second factor is the profit-oriented attitudes of individual governments, industrial companies, and ruling class. They would keep the danger of radiation secret from the prople or sacrifice the counter-radiation measures by distorting and underestimating the facts in order to derive dubious advantage from accelerated technological progress. Another highly important factor is the inadequate concern for this global problem on the part of politicians, diplomats, and the world public. Meanwhile there is urgent necessity to take measures which could comprise a special comprehensive programme and support the human right to radiation security. As a concrete step to be taken initially we propose the following actions to the United Nations, the UN Refugees Committee and other international organizations:

- (1) To introduce the new concept of the "Status of Radiation Refugees" into international law, which is similar to the existing "Status of Refugees."

- (2) To establish the "Radiation Refugees Assistance Committee" attached to the UNO.

- (3) The assistance of the above mentioned committee must be given to all the refugees that either have already left their country or the contaminated area or have the intention to leave but no possibility to do so.

- (4) To supplement the Universal Declaration of Human Rights with an article which would provide for the right of all people on the earth to radiation security.

- (5)By amending certain articles (e.g.Art.3) in the Universal Declaration of Human Rights, to widen the spectrum of rights to ecological security, radiation security in particular.

- (6) To evaluate the level of radiation and take comprehensive measures according to fair scientific approach, not tending to the promotion of atomic power, in order to protect the people from the effects of radiation.

- **(7) Taking into account the** importance of the problem, a special session should be called by the General Assembly at which environment protection NGOs could be invited to present their opinions, as well as the representatives of member states.

We realize the possibility of different views concerning our proposals. However, we firmly believe that we must decide the fate of radiation refugees without further delay. It is a crime against mankind to bring about another Chernobyl.

Vladimir Kirichansky
Secretary for Zhitomir regional organization of Journalists League of Ukraine

Valery Nechiporenko
Editor, Zhitomiraky Visnyk

Hiromi Bando
Chernobyl-Chubu Relief Assoc.
Nagoya, Japan

April/May
1992

An Unprecedented Disaster

The Government's Own Case Against Kaiga

1988 turned out to be a Watershed year in the history of nuclear activities in India. In December of that year, the Government of Karnataka, besieged *as* it was by public uproar regarding the installation of an atomic power plant at Kaiga, in the heart of the Western Ghats, organised a public debate between the authorities of Department of Atomic Energy (DAE) and the members of the protesting public. Probably for the first time in the history of such movements, environmental groups got an opportunity to debate astablishment scientists in an open forum. Represented by eminent technologists, scientists, economists and ecologists, they displayed a rare degree of sophistication and expertise in matters nuclear. The DAE could no longer brand the environmentalists as woolly headed do-gooders. In a desperate bid *to* defend itself the DAE parted with a considerable though not adequate amount of information concerning the Kaiga project. DAE did deposit some documents at the library of the Indian Institute of Science, Bangalore and shortly thereafter made some of these documents available to us through the Supreme Court where a case against the installation of the Kaiga plant is presently pending. The most important amongst the documents made available this way are the M.R.Srinivosan committee report on site selection (SSR) and the Rapid Environmental Impact Analysis (REIA) report prepared by the National Environmental Engineering Research Institute (NEERI) for the extension proposal at Kaiga. The DAE has not yet given us the Environmental Impact Assessment report for the original Kaiga project.

Even a cursory reading of these reports reveals that Kaiga site is most unsuitable for the installation of a nuclear power plant even by the government's own siting standards. The installation of a nuclear power plant at Kaiga is unprecedented for a number of reasons.

It is for the first time that a nuclear plant is being located in the heart of the dwindling rain forest. Tropical rain forests are a rare ecological niche and ought to be considered as a collective heritage of the people of India. No effort has been made to gather even elementary base-line data of the precious flora and fauna of the area which is home to many near-extinct species.

It is also the first time that a nuclear power pant is being located in close proximity to a cluster of eleven (existing or proposed) dams, in an area of proven reservoir induced seismicity. The risk due to dam failure here, (especially the Supa dam,) to the power plant is not negligible. Also here the existing water ways could maximize damage due to any accidental radioactive release to the environment.

Site Selection Committee Report

The available literature from the government's own sources justifies these fears amply and throws light on the mechanism by which the government works on these matters. Going into the details of site selection committee report, one finds that making a comparitive ment of the various sites, the committee made the following observation:

- In respect of storage of solid radioactive waste, rocky substrata and low water table are desirable for safe burial and containment of waste. But in the Kaiga area, the report notes that the water table is above ground level in the high water table season. This is evident to anyone who has cared to visit tis area in the monsoons.

- For rapid dispersal of radioactive waste, it is desirable that good wind speeds be associated with the topography. But the report notes that at Kaiga, the topograghy is predomiantly hilly, somewhat close to a large bowl with a valley providing the opening. The calms are also reported to be high.

- In respect of access and transportation facilities, the report notes that broad guage rail heads are far away at Mangalore and Hospet at distances of 330 and 355 kms respectively. All other sites, Tungabhadra, Kudankulam, Bhoothathankettu, Nagarjunasagar and Kalpakkam have better transportation facilities. Even regarding ocean transport, Karwar does not have the requisite draft for receiving big ships for construction work. The report clearly states that "there are no existing facilities and infrastructure at Kaiga which can be made use of during construction."

Clearly, the Kaiga site is endowed with the poorest communication and transport facilities of all the proposed sites. This issue is neither unimportant nor peripheral as may seem at the outset, especially in light of the fact that the Rama Rao committee has identified poor transport facilities as the main reason for the failure of the Rajasthan Atomic Power Station, Rawatbhata to perform satisfactorily.

In respect of foundation conditions and the seismic environment, a prospective site must be endowed with good bed-rock conditions, but the Site Selection Committee has done only limited bore hole investigation and provides no data about these.

Rapid Environmental Impact Analysis Report

However REIA has a lot to say about the bed rock and seismic conditions. It states that "the whole area has undergone extensive laterisation and among the 17 bore holes dug for geological investigations, core recovery has been poor to very poor." The report further states that:

- There are major geological faults in the region between Haliyal and Sirsi. The Kaiga site straddles a confluence of three major faults which makes the site "vulnerable ". The Kaiga site is in a parallelogram whose south-western angle was the epicentre of the earthquake triggered by the Koyna dam reservoir.

- The course of the Kali Nadi river runs parallel to lineament No. 11 and (his is a source of major concern as seven dams of the size of Kadra Dam have been planned in the the area.

The 1967 Koyna earthquake was triggered by impounding of water and the reservoirs which have been planned will go a long way in lubricating faults, fissures, joints and fracturess, both major and minor and make the site unsafe from a seismological point of view. Lineament No. 11 is specially active and the Kali rive runs parallel to it. The Kaiga site and it's water resources are intimately connected with it. It is thus clear that from a geological point of view, Kaiga does not satisfy the basic criteria required of a site for an atomic power plant.

Apart from these, there are a number of other factors that have been overlooked. The report admits that investigations of the micrometereology of the Kaiga site are inadequate and incomplete and the effect of evaporating 300 million litres of water per day on the temperature, humidity and aquatic life has not been investigated. These effects are unlikely to be benign on the sensitive environment of the rain forests. The REIA makes no mention of the release of tritium, a radioactive isotope of hydrogen in the form of tritiated water.

In the matter of rudioactive waste disposal, NEERI has no independent expertise and has left this whole mutter to the Nuclear Power Corporation itself. No evaluation of the management of wate transport, location of waste storage sites, and waste transportation routes has been done in the report. Base line health data have not been collected but a cursory mention of the prevalence of cervical cancer among the females of the Gowda community has been made. But there is no epidemeological 6tudy to quantify this observation or identify the causes.

However, a socio-economic survey has been carried out which points out that half the surveyed population is opposed to the project and among the rest who support it, about half do so because of the promise of jobs held out to them by the NPC personnel. Terming the opinion held by the people opposing the project as "wrong ", the REIA recommends that the NPC personnel must carry out a "campaign " to correct this. One wonders if such suggestions from NEERI are a part of the terms of reference!

Why Kaiga?

If the Kaiga site is unsuitable on ecological, geological, geographical and strategic considerations, why then is the government going ahead with the Kaiga project even when a majority of the local populace is opposed to it?

The answer can be found in the site selection report. The committee admits that not all factors influencing site selection are objective and quantifiable and a certain subjectivity invariably arises while making a comparitive evaluation of several sites. This I believe is one of the most candid admissions to be made by out technocrats because all those years they had steeled themselves within the fortress of "objectivity " and technical expertise and flung the epithets of "subjectivity " at environmentalists

Mow has the site selection committee resolved this dilemma of objective facts that disqualify Kaiga and the subjective compulsions of installing a plant there? The report answers the question by suiting that only "techno-economic " criteria wort⁴ relied upon in recommending Kaiga as a suitable site. In fact, the Chairman of the Atomic Energy Regulatory Board, in a fit of honesty admitted during the December '88 donate, that Kaiga was a political decision.

This brings us to the central issue at hand. Can the welfare of the people and their democratic will, be sacrificed at the altar of political expediency?

A quick review of the reports of the three previous site selection committees, reveals that Kaiga was never even mentioned by the Hayath (1962), Vengurlekar (1975) and Kati (1982) committees. Whileevery other site such as Kalpakkam, Kudankulam, Tungabhadra and Nagarjunasagar have a history of being favourably considered by successive site selection committees, Kaiga does not find a mention in any of the earlier reports. Even more intriguing is the fate of the Kati committee report which was submitted as late as October 1982 and which does not recommend Kaiga. One fails to understand why the Srinivasan committee was constituted in September 1983 barely an year after the Kati committee submitted its report. None of the siting criteria could have changed in an year's time and yet we have Srinivasan committee (which relied heavily on the data compiled by the Kati committee), coming out with a new list of suitable sites. Kaiga came from nowhere to the top of this list!

A Mammoth Project

Unlike others, the Kaiga project is a mammoth project, the dimensions of which only a few have realised. The Kaiga Atomic Power Plant is contingent upon the successful completion of the Kadra Dam, which itself has overrun its time schedule by over three years and is still not even half complete. Kaiga is viable only if the Kadra reservoir receives the requisite quantity of water after which a 8 kms long channel has to be constructed for the outflow and inflow of water to the atomic power plant. Meanwhile the Kaiga project can be completed only when the Karwar port is developed sufficiently to be able to berth ships of the requisite tonnage that can bring in the heavy equipment to be erected there. Simultaneously the forests are being surveyed for the laying of heavy tension lines to energize the reactor as well as to evacuate power over enormous distances. Each of these projects by themselves can be daunting and the success at Kaiga is dependent on the simultaneous success of all of these. While the psychological predilections of being a developing country compel us to take on such mammoth tasks to "prove" to the world our technological power, can we really afford to commit our meagre resources to such empty challenges?

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Can Conservation Replace Kaiga?

Everyone 'knows' that energy conservation is the first alternative to nuclear power. However, there is a general misconception that conservation simply means using less electricity — that it implies a primitive lifestyle that foresakes the modern comforts offered by electricity. While an austere lifestyle may be intrinsically desirable, it is not the only alternative. In this article we devote ourselves to examining the possibilities of obtaining basic needs and comforts by using minimum amount of electricity required for the job.

Take lighting for example. No environmentalist would argue that we should not use electricity for lighting. But what we can and should be doing, is to get down to basics and ask whether it optimizes the ratio of light generated to electricity consumed. The answer is an emphatic NO in case of incandescent bulbs. In a bulb, a tungsten filament is heated to a very high temperature, where the glow is sufficient to perform the lighting. The electricity here is used basically to generate heat, not light. The light comes as a by-product. On the other hand a flouroscent lamp, or a tubelight as it is generally known, uses a different technology to generate light in a more direct fashion. Using a tubelight amounts to a better, more efficient utilisation of electricity.

This much is common knowledge. Our electricity boards often advertise, exhorting people to use tubelights and save energy. But the higher initial cost of tubelights has inhibited their widespread use. Should not the government then subsidise the tubelights to promote their use? Should it, for example, divert the funds from our atomic energy projects towards subsidizing the tubelight industry? The answer would be yes, provided it made economic sense. That is, if one could save more electricity more cheaply by using a large number of tubelights than by constructing and operating a nuclear power plant.

Just how many tubelights are required to replace a reactor? Let us first calculate the energy generated by a nuclear power plant. A typical plant of 235 MW operating for 25 years continuously, would generate 235 x 1000 x 365 x 24 = 51465 million units of electricity

For the uninitiated, one 'unit' of electricity is generated when a plant of 1 kilowatt capacity works for one hour. Above we have converted 235 megawatts into kilowatts and multiplied that by the number of hours in a year. However, none of our reactors work anywhere near their installed capacity! The average for the nuclear power plants operating in the country is just 43%. Even if we assume a 50% plant load factor, the units generated come to 51,465 X 0.5 = 25732.5 million units. But not all the energy generated is available for use. India has an astonishing and shamefully high figure of 23% for transmission and distribution losses. Even if we make a saving of 2% in this, we could do without nuclear power, but that is not the point of this article. In other words, only 77% of the electricity generated is available for public use. Thus, we have 25,732 X 0.77 = 19,814 million units available for public use.

How many tubelights are needed to save these many units of electricity? The latest compact flourescent tubes consume no more than 20 watts of power but give the same amount of light as a hundred watt incandescent bulb. Further, the typical life of these new tubes is 10,000 hours. The compact tubes work over a wide AC input range unlike the standard tubelights presently available on the market. If we replace one 100 watt bulb with a compact tube, it will save us 80 watts X 10,000 hours = 800 units of electricity. Therefore, to save 20,000 million units we need 20,000 million / 800 = 25 million tubelights Now, the question that comes is how much is all this going to cost. Nuclear reactors, by the governments own admission, cost well more than Rs. 1,000 crores. The open market price of the compact tubes is about Rs 200. But this includes the profit margins of the manufacturer and the dealer and also the marketing and distribution costs. If the government were to set up a plant for manufacturing the tubes, the price would come down substancially, particularly when one considers the economies of scale involved in producing two and a half crore tubelights! However, even at the present inflated market rates the cost of these two and a half crore tubelights works out to be just Rs.600 crores, just half that of a reactor.

Instead of setting up a reactor, all that the government has to do is to manufacture compact tubes in large quantities and distribute them absolutely free of charge to the public. All public illumination and lighting of official buildings can be changed over to the more efficient technology. The public will certainly respond enthusiastically since they will get the same or better illumination at 20% of the electricity bill. The new tubes can be engineered so as to fit into the existing lamp-holders, so the changeover will not require any additional effort. The reactor can be scrapped.

A few comments and clarifications are in order. The Rs 1,000 crore figure is only the admitted cost of the reactor. The true cost of nuclear power can be mind boggling and hence the tax paying public is kindly spared this distressing bit of knowledge The cost of decommissioning and waste disposal are not included by our nucleocrats in their calculations. Decommissioning is not acknowledged as a problem and waste management is swept under the carpet of reprocessing, vitrification and fast breeder reactors. However, the cost of these is enormous and has to be paid for by future generations.

The 50% plant load factor is also highly optimistic. None of our reactors have shown any promise of working for 25 years and still end up with a gross figure of 50% at the end of it, as assumed in the calculations. CANDU reactors are known to age fast, and are likely to need scrapping after less than twenty years only. Prolonging their life will require massive overhauling exercises involving heavy additional cost, as the Canadian experience demonstrates. Despite the most unfavourable and conservative estimates, the above calculations show that energy efficiency in lighting applications alone can save as much electicity as can be expected from a nuclear reactor at half the cost. The scheme is environment friendly, will have full public support, has low gestation period and can be decentralised easily. And yet it will not be taken up seriously as an alternative to atomic energy because of just one shortcoming!

Compact flourescent tubes do not produce any plutonium.

Sanjay Havanur
Citizens for Alternatives to Nuclear Energy
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A Warning

Radioactive wastes from nuclear reactors are being introduced into compact tubelight fixtures as materials in glow starters and these are being sold in India. These have been and are being discarded in the West. Compact fluorescent tubes (CFT) with non-radioactive materials are available. These give the same light as a 60 watt incandescent bulb but consume only 11 watts. These CFTs use electronic circuits and avoid radioactive starters. The claimed efficiency is more than four times that of conventional tubelights. However, an enquiry from India importers revealed no information on the energy audit of CFTs. The energy investment including that used in the production of materials used in the construction of CFTs and its accessories is essential to estimate the net life-time energy saving resulting from the new device. CFTs cost a great deal more than an incandescent bulb. The cost of a tubelight using radioactive material should really include the overheads introduced from the nuclear enterprise from which the radioactive material emerged as waste in the first place. Just because someone like a weapon's manufacturer has free access to these wastes does not bring down the real cost of a commercialised product using such wastes. Krypton-85 used in these glow starters is a deadly radioactive gas emitting gamma rays which can travel long distances and each ray has an energy of 517 kilo-electron-volts. Just one such ray would traverse some 70 cells and injure them all in microseconds. The repair of cells takes a much longer time (4.3 billion times more than the microsecond it took to cause the damage and then all the cells are not fully repaired.) The power of such energy transfer is of the order of 2500 watts to these cells. We must compare this to the power produced by the whole human body of some 170 watts! Thus, a gamma ray hit results in a strain to the affected 70 cells of about 15 times the whole body normal work. The corresponding shock delivered is something like 250,000 volts when the ray ionises a cell to eject an electron out of the cell. And there will be tens of thousands of ioni3ations inflicted **on** the cells by each such gamma ray. And this is the lowest possible dose from the radioactive source. That is why there is universal agreement that htere is no safe level of radiation and this one ray can cause cancer or depression of the immune system. Thus, when we can avoid unnecessary exposure to radioactivity we must avoid it and ensure that standards of health and well-being are not unnecessarily compromised.

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Rawatbhata Health Study-Some Preliminary Results.

Originally we had expected to publish a detailed analysis of the study on the health of the people near the Rawatbhata Atomic Power Plant (RAPS), in this issue. Unfortunately, the work of data entrty into the computer has taken much longer than our expectations. Therefore, a detailed analysis would have to wait. However we are puublishing this preliminary report since the plant authorities in Rawatbhata have started claiming that we did not find any effects at all and hence our silence. However we do hope to publish the full report within a month or so.

Survey Methodology

We wanted to find out definitive answers to two basic questions.

- 1. Has the operation of the nuclear power plant resulted in any adverse effects on the health of the people living in the vicinity?
- 2. Has this massive development project made the poor less poorer?

To this end, we decided to select 5 villages in the vicinity (less than 10 Kms.) of the plant, in the East-Northeast direction and compared them with a group of villages around 50 Kms distant from the plant. For greater details of why particular villages were selected, please refer to the article, A report on the Rawatbhata Health Survey in October/November 1991 issue of *Anumukti.*

The other point that was decided was to obtain information from each and every household in the selected vilages, and not rely on a random sample. This was done to avoid any possibility of bias in the selection of the sample. Of course, despite our best efforts, a few houses have been inadvertantly left out since the respondents were not to be found at home despite repeated visits. However, the number of such "missed" households is less than 2 percent and would make no difference to our conclusions.

All the people who complained of any serious symptoms were examined by doctors and the statistics are based on their diagnosis.

Conclusions

Till now, we have only analysed questions in the survey schedules which pertain to the health aspects, and there is no doubt at all that the health of the people in the nearby villages is much worse than that of people in the distant villages. The health picture ofthe two areas presents some telling contrasts.

- 1. Whenever a comparison is made of symptoms like short duration fever, weakness, breathlessness, cough etc. one finds there is no significant difference between the two populations.
- 2. Similarly diseases such as diabetes, heart conditions, hemiplagia (one sided paralysis), etc. there is no difference between proximate and distant villages.
- 3. Diseases of the skin, digestive tract, sex organs, chronic and crippling infections all show a significant increase in the nearby villages. Specifically four times as many people suffer from skin problems, three times as many from digestive problems and three times as many from sexual disorders.
- 4. However, the most startling contrasts appear in the comparison of solid tumours and congenital deformities. More than ten times as many people have different kinds of tumours in the nearby villages. Similarly the proportion of congenitally deformed persons is four and a half times higher in villages near Rawatbhata.

A point which needs to be noted strongly is that the health effects are far more significant and pronounced if one considers only young people of both areas. Thus, people who have been born after the reactors have started operating show far more deterioration in their health status than older people.

Questions besides those dealing with health have not as yet been considered in the analysis. So, right now we are abstaining from attempting to answer the second question in the previous section. However, information to give an unambiguous answer to this question has been obtained and we hope to do so shortly.

Surendra Gadekar

LETTERBOX

Recently I had an occasion to go to Rawatbhata. Right now the government is engaged in a strong propaganda effort. Even a short term course on radiation biology at Jaipur was full of one sided statements favouring atomic energy and denying any radiation effects. Employees of Rajasthan Atomic Power Station were among the speakers. They are trying to create an impression that the survey that you conducted around Rawatbhata did not find any adverse health effects and that is why the results have not yet been published. Therefore, the quicker the results of the survey are published, the better.

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Rampura M.P. 458118

Anumukti is a wonderful journal and has been very useful to our cause. Since I first wrote to you (see *Anumukti* Vol.5 No.l) The Yankee Utility has decided to close forever its Rowe reactor. While we are all ecstatic about this, we still have much work to do. We are planning to continue with a comprehensive health study of this region. We are also continuing our research on such things as high and low level waste, emergency planning and evacuation, and the economics and politics of atomic power, etc. In addition to continuing our local grassroots organizing Citizen's Awareness Network (CAN) is seeking funds from various foundations to assemble an organising packet (based on our successful campaign against Yankee Rowe) to distribute and give assistance to other organisations around reactors. In the tiny region of New England alone, there exist seven other nuclear power plants, six of which are at least twenty years old and are beginning to show dangerous signs of aging.

CAN has also arranged meetings with two different delegations of grassroots organisers from Japan. We have also had correspondence from a group in Mexico and with two from Canada. The last delegation from Japan petitioned the United Nations to include in its "Refugees" category, a definition for "Radiation Refugees". (See Radiation Refugees page 7). CAN is in the process of drafting a similar petition. With all this international correspondence and exchange of information and ideas, 1 am feeling that an international, grassroots organizing forum or conference is needed. We are all doing such good hard work. I believe that if we band together in solidarity and combine our knowledge and skills then we will be well on the way to preserving our planet. We are all nuclear refugees.

Ms Gail Steinbring
Citizens Awareness Network
P.O.Box 83 Shelburne Falls,
MA 01370
U.S.A.

Your cycle yatra must be proceeding smoothly. I am sorry that 1 missed your programme in Bombay. There was very good coverage in the Bombay papers about the yatra. I had gone on a padayatra to Dandi in 1980, and therefore I have some idea of the kind cf experiences that you must bo having in your trip. Of course, since we were walking, communication was even more poor and anyway during the last twelve years communication network and telephones etc. have become ten times better, and so the feeling of being cut-off from the world is not so strong, but even then one eagerly awaits any letters that might be waiting at the next contact address and that is why I am writing this letter to you.

Usually, if one is travelling for a cause, one tends to be extremely busy and overworked — late nights etc. For cyclists the best time to travel is early morning if you can force your hosts to let you go at 5 AM. You must be careful of the eating habits of all the members of the team. Many do not feel any apetite, but they are actually quite hungry. But since you have earlier experience of cycle yatras, so you know most of those things quite well.

You would be meeting hundreds of people at a personal level, (and that makes me jealous!). Antinuclear issues apart, there are a lot of other related matters which need to bo discussed and could bo talked directly to the people. Many people are more receptive to new ideas from a travelling group interacting on a personal level.

In the light of recent economic and commerce policy we are not only endorsing the Western model of development, but we seem to be endorsing Western definition of happiness! This model is totally energy intensive. Do we not need to fight this basic tenet? In the West, the per capita energy spent is considered to be the index of development. If we accept that, then where we derive our energy from becomes a matter of secondary importance at best. It is not the government alone which determines energy policy. People are also responsible for the choice. I feel that the yatra type of contact is effective in making people think about themselves and their choice of lifestyle and in which way they can contribute towards changes. Please avail of this opportunity to raise these important issues.

Paresh Vaidya
AFD, BARC, Bombay 400085

While BARC officials like Mr V.V.S.Mani on the one hand, write that long lived radionuclides area long term hazard and need to be isolated from the biosphere, *(Nuclear India),* on the other hand BARC is freely permitting the use of ionisation smoke detectors with radioactive material inside them for ever in contact with the environment. The radioactive material inside the detector is Americium 241 which decays to Neptunium 237- which has a half life of 2.2 million years! The proliferation of these radioactive smoke detectors in industrial and office establishments all over the country poses a serious risk to the blue and white collar workers and managers who are committing suicide in a state of blissful ignorance. Krishna! please come quickly and show the world Anumukti.

R.Ashok Kumar
Bombay

In your February-March 1992 issue, on page 6 under the subheading "India's Record of Democracy", the following sentence appears: "Free movement is not possible in a quarter of India's territory, because there are just too many armed men out there! This may be so in the North and North West on the borders of Kashmir and Punjab and also perhaps in the territory north of Cutch and Rajasthan, as these ore areas from which illegal immigration and militant terrorists sneak in to cause disturbances in India. But I wonder, if this would cover a quarter of India's territory. Besides, you appear to suggest that the absence of free movement is due to reasons other than those of national security and involves avoidable and unnecessary restrictions on the freedom of movement. I think these inferences would not be correct.

R.K.Patil
Civil Lines, Nagpur

Let me share with your readers two interesting things that I read in other (uncommon) journals. One is from an excellent interview with Vandana Shiva, the well known environmentalist, in the Unesco Courier of March 1992. In response to a question-regarding the her changing her profession from being a nuclear scientist to the present one, she says (I quote only the portion relevant to anti-nukes, though I recommend the whole article highly to all interested in environmental concerns);

"*... real, profound understanding of nature was supposed to be reached through physics. Then I went to nuclear physics, where I experienced massive disappointments. It was only when I was doing my master's degree that I realized how unthinking nuclear scientists were about the question of radiation hazards. We were taught how to create chain reaction in nuclear material and we knew all about energy transformations, and so on, but nothing about the interaction of radiation with living systems. I learned about radiation impacts from my sister who is a doctor. When I was working in a nuclear reactor in India, she kept saying: "Promise me you are never going to go back there!" "But why?", Id say and she would reply, "you could have babies with mutations. You don't know what's going to happen to you." "When I was groping my way and exploring these issues, senior physicists would say, 'You don't need to know these things," Again this was an exclusion and a violation of my search for knowledge. If science means to know, then I had no scientific training."*

No wonder our nuclear scientific community is so agitated and cannot accept when you tell them about Rawatbhata study or any other effects of radiation contamination. In fact, the MBBS syllabus itself has one and half a page on radiation.

The other niblet is from the Safe Food News of Food and Water Inc., quoting from *Atoms and Waste* of Feb.6,1992:

State of the Art?

Sledgehammers Used to Close Safety Valves

Wisconsin Electric Power Company (WEPCO) routinely used an eight pound sledge hammer to close safety valves at its Point Beach plant The values - giant main steam isolation valves — are required to close within seconds under accident conditions to prevent radioactive gases from leaving the containment area. The Point Beach personnel interviewed by the Nuclear Regulatory Commission (NRC) reported that valve falilures "had become so routine that the use of operator assistance in closing these valves (with a sledgehammer) was considered an acceptable practice. WEPCO had been fined $160,000 for this and other safety violations."

Doesn't that make our nuclear establishment quite equal to the American one? Only Atomic Energy Regulatory Board (AREB) wouldn't do any of what NRC has done. If they read this, they would perhaps, rest even more content.

The Feb/March issue of *Anumukti* is excellent. It has been more prompt in production than when you happened to be settled in your headquarters! Maybe, cycling increases your efficiency. I particularly liked two articles in it: *Principles of Ecology* — excellent, prompting good soul searching, expansive. The other one is V.T.Padmanabhan's critique of CSE's paper on -Earth Summit- adds a very vital dimension beyond the simplistic polarisations in CSE's paper.

I would suggest that you give an author by-line rather than ghost I's writing or giving it like a Letter to the Editor type. It could even improve the get-up, too. I believe that it is a journalistic principle that when opinions are expressed, authors should be revealed.

K.Krupa
809,17E Main, 5th Block
Rajaji Nagar, Bangalore 560010

Report

National Antinuclear Convention at Peringome

Anumukti cycle yatra crossed the Karnataka-Kerala border on the 24th of April. The yatra started from Kasaragod early in the morning of the 25th and reached Payyanur in the evening.

All along the route people assembled on both sides of the road to welcome the yatra. Public meetings were held at various places like Manikkoth, Kanhangad, Nileswar, Cheruvathur, Kalikkadavu, Karivellur, Karamel and Annur in Kasargod and Kannur districts. Thousands of people gathered at Payyanur to welcome the Yatra. Eminent Gandhian activist and poet Sri A.V. Sreekanta Poduval presided over the large public meeting at Payyanur.

On 26th of April, Anumukti cycle yatra proceeded to Peringome - the site of the proposed nuclear power plant. The yatra was accompanied by numerous other cyclists from various places near Payyanur. Meetings were held at Kankol, Kundemkovval, Mathil and Aravanchal enroute. As the yatra reached Purakkat para, the actual site of the proposed reactor, a large gathering of men women and children, gave them a very warm and touching welcome with great emotional fervour and enthusiasm. The cyclists were garlanded to the accompaniment of beating drums and fireworks. The leaders of the yatra, Drs Sanghamitra and Kusuma were presented with white doves as a token of people's love for peace and concern for a non-nuclear world. Thousands of people watched as the doves flew into the skies of freedom. Everybody joined in and formed into a large procession which marched through the main street of Peringome in a massive demonstration against nuclearisation of India.

The valedictory meeting was held at the end of the demonstration. The whole gathering stood up in silence for a minute to pay homage to the victims of the Chernobyl disaster. Prof.R.V.G.Menon, Dr Surendra Gadekar and Dr .Kusuma spoke on the occasion. Prof Menon exposed the untruths being propagated by the nuclear establishment and contended that Kerala needed no nuclear plant to satisfy either its present or its future needs. Dr Gadekar stated that Chernobyl had exploded the myth of the safety of nuclear power. Dr Kusuma emphasised that women had an important role to play in the antinuclear movement and exhorted the women of Peringome to join the ongoing fight to prevent a nuclear plant coming in. The meeting ended with a slide show by Dr Sanghamitra about the health effects being observed in villages around the Rawatbhata nuclear power plant in Rajasthan. Dr Surendranath, the chairman of the Antinuclear Forum of Peringome who presided over the meeting thanked the cyclists from different parts of the country for coming over to Peringome and expressing solidarity with its people.

On 27th morning, there was a session presided over by Surendra Gadekar on "Conservation and Alternative Sources of Energy" Speakers included Prof Menon, Ashok Kumar from Bombay and N.Swaminathan from Thrissur. The last session was for sharing of experiences of activists from different parts of the country and based on these experiences for consideration of future programmes. Dr Sanghamitra Gadekar chaired the session. Anton Gomez, N.Subramanium, Dr Kusuma and Dr Sanghamitra narrated the present state of the antinuclear struggles of Koodankulam, Peringome, Kaiga, Kakrapar and Rawatbhata respectively. After that the meeting was broken up into small groups to decide about future programmes and spokesperrsons from these groups later reported the conclusions to the plenary.

The following are some of the suggestions that came up during the discussions:

Common Ground

Issues need to be identified on which there is unanimous agreement among antinucler groups and individuals. For example, the need for scrapping the Atomic Energy Act of 1962; the need to study the health and environmental effects around nuclear installations; the need to press the government to issue a white paper on the nuclear programme; familiarise activists and people with alternative technologies; the need for better press coverage of antinuclear issues, etc.

Better Networking

Anumukti needs to become a better instrument of networking between various groups. Peringome Antinuclear Forum suggested that efforts should be made so that more people subscribe to *Anumukti* and each group should make it a point to write a letter every month to various groups and to *Anumukti.*

Coordination

There should be increased coordination between antinuclear groups and other like minded groups such as environmental groups, health groups, human rights groups, women's groups

Some groups felt the need for a central committee or a contact council at a national level. However, a decision on this was shelved since others felt that the convention was not fully representative of the various regions of the country. There was universal agreement on the need for organising more cycle yatras and other awareness raising people's contact activities. The Kakrapar group issued an invitation to others to hold the next national convention at Kakrapar.

The need to conduct more health surveys around nuclear installations as has been done in the case of Rawatbhata was emphasised. There was need to train people in conducting such surveys. The *Anumukti* group offered the facilities available at the Sampoorna Kranti Vidyalaya campus to conduct such workshops and training programmes.

The question of how to take a political stand was discussed at length. Also there were differing views expressed regarding the need for nonviolence in antinuclear protest. After summarising these suggestions in the plenary session, the meeting called upon the government to abolish the Atomic Energy Act of 1962 and to publish a White Paper on the working of Indian nuclear plants. It also requested the government to stop further nuclearisation of the country. The meeting also adopted another resolution condemning the police repression and high-handedness against the activists fighting for their rights in the Narmada Valley.

The meet ended on the evening of the 27th of April. All the activists felt more enthusiastic about future work. Most participants felt that the Peringome meet and Anumukti cycle yatra had instilled greater confidence in them.

K.Ramachandran
Payyanur

Editor's Apology

It is already July and this is the April/May issue. I do not know what to say. I have apologised many times in the past but apologies however sincere can be no substitute for substance and I still don't manage to bring out Anumukti in time. In fact, we are falling behind schedule. The June/July issue, whenever it does appear and I hope that is within July, would still be late.

Shortage of material fit for the journal is not the problem. Actually, the opposite is true. The flow of news items on nuclear issues is something of a flood and one is liable to get drowned. Anumukti coulld be a monthly and still have enough 'matter'.

The bottleneck lies in the fact, that right now, Anumukti group consists of just three people, all of whom have other, sometimes more presssing, committments. For example, although I am the editor, I am first a farmer and the month of May, the time just before the rains, is the busiest time. Journals have deadlines but plants are dead if they do not receive tender loving care in time. And everybody being away for a month during April for the cycle yatra doesn't help at all. So if any of you can volunteer to come and stay some time in Vedchhi and become part of the Anumukti family, do not hesitate for a minute. Apply now. See Advertisement on page 6 of this issue.

The other point I need to apologise profusely is the fact that in the last issue, I missed giving credit to people whose articles appeared in the issue. Ms Krupa has rightly pulled me up for this lapse. I would see that at least this sort of sloppishness doesn't take place again.

Anumukti deeply regrets the untimely death at the young age of 26, of the antinuclear activist N.Swaminathan of Altermedia of Thrissur, Kerala

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Lifetime: Rs 250/- (only wiithin India)
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Anumukti team: P.P.Baburaj, Sanghamitra Gadekar and Surendra Gadekar

Editor: Surendra Gadekar
Subscriptions, donations, manuscripts, enquiries regarding circulation should all be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi via Valod
Dist: Surat 394641 INDIA

(Please do not send personal chheques in the name of S.Gadekar)
Published by S. Gadekar for Sampoorna Kranti Vidyalaya and printed by him at Parjjat Printery

PRINTED MATTER **BOOK POST**

Ahemedabad.

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Vol.5 No.6 June/July 1992

Now is The Time to Resist Uranium Mining in Meghalaya

The Centre has allocated "sufficient funds" in the Eighth Plan for the setting up of a commercially viable uranium processingunit at Domiosiat, 140 km from Shillong. It has also asked the Meghalaya government to acquire the necessary land for further exploration and resolve the ongoing dispute with the district council authorities at the earliest.

Uranium was found at Domiosiat in 1989 after five years of exploration work. Samples were rushed to the Atomic Minerals Division for testing. In 1990, the division's report confirmed the presence of a rich vein of uranium. In August 1991, an official announcement of the 9,959 tonne deposit of U_3O_8 was made. This is the largest single uranium deposit in the country after Jaduguda in Bihar. Immediately after the uranium reserve was found in Meghalaya's East Khasi Hills, the local tribal residents raised a strong protest against further exploration as they feared large-scale evacuation from the area and adjacent villages. The irate residents also chased scientists and other staff with bows and arrows.

The tribal district council also raised objection over the acquisition of land for exploration work. The central government, in a letter issued last month, asked the state government to sort out the problem with the district council authorities and acquire the land for setting up of a semi-processing unit. The Uranium Corporation of India Ltd (UCIL) has also been asked by the Centre to step in and commence commercial mining.

Meanwhile, former state minister, Hoppingstone Lyngdoh led Hill People's Union joined the agitating local residents and is now trying to mobilise mass opinion against further exploration and setting up of any mining and milling unit.

Another major irritant is the Khasi Student's Union, which has recently stated that the Centre can begin exploration work only if it agrees to give 50 percent value of the mined uranium as royalty. The government has yet to react to this proposal.

However, two prominent Khasi leaders of the state — Prof.G.G.Swell and former Chief Minister B.B.Lyngdoh — have responded positively to the Centre's plan to begin exploitation as "Uranium is national property."

The two leaders have asked the Centre to ensure proper rehabilitation of the evacuated tribals. The ruling state Congress Government has also made it clear that it would take all measures to rehabilitate local residents, if required.

The local protest over the uranium deposit is remeniscent of that over the linking of the state by rail. The government's efforts to put Meghalaya on the country's rail map failed as local tribals resisted the move fearing "massive Invasion of plainlanders." They pointed out that natural resources and coal would be taken away from the state thereby "exploiting" the local residents.

However, sources in Meghalaya rule out any such protest this time against setting up of the proposed uranium unit.

Sujit Kumar Chakraborty
The Observer of Business and Politics
July 9,1992

A Reply

While the Khasi Jaintia Environment Protection Council (KJEPC) delegation, were discussing with officials in the Prime Minister's office, the KJEPC's stand on uranium mining and its demand to declare the Khasi and Jaintia Hills as a Nuclear Free Zone, we were shocked to read Sujit Kumar Chakraborty's article entitled: "Funds Allocated for Setting up of Uranium Unit in Shillong."

The article was revealing, both in its detail and scope of uranium mining and processing to be undertaken by the Government of India and also regarding the double standards of our political leaders, for in Shillong, the Meghalaya Federation of Regional Political Parties has passed a resolution against uranium mining and processing. According to press reports in Shillong, Mr D D Lapang, the Congress Chief Minister of Meghalaya has taken up the matter with the Prime Minister.

The Janata Dal in Meghalaya has also issued a statement opposing uranium mining in Khasi and Jaintia Hills. The Hynniewtrep National Council, a newly formed political party, has also resolved to support the demand for declaring Khasi and Jaintia Hills as a nuclear free zone.

The last para of Mr Chakraborty's article contradicts his earlier ones. In fact, the West Khasi Hills Action Committee and the Sohryngkham Area Development Council had sent telegrams and copies of their resolutions on the subject to the President and the Prime Minister but no response has come till date.

Rev.Prechard B.M. Basaiawmoit
Convenor, Khasi-Jaintia Environment Protection Council

From The Editor's

Recently, Jyotibhai Desai gave me **a** poem to read. I want to share it with you. It is written by a thirteen-year old child from SriLanka. And in these mad times, when the Chairman of the Atomic Energy Regulatory Board, — a person, whose first responsibility should be providing protection to the public, disregards mandatory safety **regulations**—(See following story) it is a solace to think that sanity still **prevails.**

BOX OF COLOURS

I *had a box of colours*
Shining Bright and bold,
I had a box of colours
Some warm and some very cold.

I see no red for the blood of wounds
I had no black for the orphan's grief
I had no white for the dead faces and hands
I had no yellow for the burning sands.

But I had orange for the joy of life
I had blue for the bright clear skies
And I had green for buds and nests
I had pink for dreams and rests.

I sat down and painted

PEACE

ADVERTISEMENT

The nuclear industry works internationally. This is one important reason why I wait for each new issue of Anumukti: The resistance against nuclear power also has to cut across national borders.

We are preparing for an international exchange programme for young activists, starting in November/December this year. If the necessary funds can be collected in time, we want to give a young activist the chance to experience the resistance around a nuclear waste dump as well as around three nuclear power stations near Hamburg in Germany for a period of about four weeks. In exchange we expect the activist from abroad to share her/his experience with groups and initiatives, here. Accomodation will be in the Kurve Wustrew, a training centre for non-violence.

Please invite the younger generation of activists among your readers to contact us at the following address:

• HagenBerndt
c/o Kurve Wustrow
Kirchstr. 14
D-W3135 Wustrow

Critical Safety Checks Not Being Observed In KAPP-1

BOMBAY, JULY 25: Sources within the nuclear power industry are concerned about "a serious lapse" in ckecking vital safety installation at Unit-1 of the Kakrapar nuclear power project, which is due to be commissioned shortly. The "unwarranted haste" to achieve criticality, overdue by a year, has caused the project authorities to allegedly bypass 'integrated testing' of the "Emergency Core Cooling System" (ECCS). This is the only backup system available in case of a 'loss of coolant accident', and its failure could lead to a 'core melt down accident', they warn.

According to these sources who wish to remain anonymous, integrated testing of the ECCS is practically possible only once in the lifetime of a reactor. This backup system automatically comes into play during a 'loss of coolant accident' (LOCA), when the normal reactor coolant drains out, and is not available for cooling the reactor core. This situation may arise if there is a breakage in any of the complex web of pipes that cool the system.

Under this integrated test, a LOCA is simulated, and all components of the ECCS are evaluated, with the primary heat transport system pressurised and heated up. In this simulated test the reactor core is not loaded with heavy water, and is instead flooded with ordinary (light) water. Once the reactor is set for critically, and the Primary Heat Transport System (PHT) is filled with the expensive heavy water, the integrated testing of ECCS is not possible.

Although injection of light water into the PHT is a component of the ECCS, its activation in a non-emergency situation would seriously harm the PHT system bacause the highly radioactive heavy water would contaminate ordinary water, becoming "downgraded" in the process. With heavy water costing Rs 10,000 per liter, and the PHT holding at least 40 tonnes, this would cause a major economic loss.

According to these sources 'integrated testing' of the ECCS is a mandatory regulatory requirement, and no other subsequent commissioning activities such as fuel-loading, addition of heavy water in the PHT system, can be permitted till this requirement is met. Apprehension *on* this aspect are clearly expressed in a note written by K. Natarajan, chief engineer (instrumentation and control) and a member of Kakrapar Design Safety Committee (KDSC). (See Box)

The Atomic Energy Regulatory Board (AERB) authorities, who were shown a copy of Natrajan's note, said they had no reason to doubt its authenticity, but dismissed its contents as opinion".

According to sources, this note make amply clear that 'integrated testing' of ECCS was not performed at all, or if performed, did

POWER MATTERS.
BUT SAFETY MATTERS MORE
IN THE OPERATION OF NUCLEAR POWER PLANTS.

Ensuring continuous cooling of reactor fuel and maintaining integrity of five successive barriers between radioactivity in fuel and the public, are safety requirements of the highest concern constantly achieved by specially licensed plant operators, strictly adhering to Technical Specifications" issued by the regulatory body which reviews their compliance regularly.

DOES IT REALLY?

ECCS Tests in KAPP-1

Refer Report No KAPP/ 33350/ 92/B dated April 09,1992.

The tests have been repeated and new operating points set. They are acceptable for KAPP-1 operation.

However, a total integrated test with all the subsystems, components and logic functioning, should be done to confirm performance as per design intent in toto.

This must be done in KAPP-2 as soon as the system is ready and any retrofitting found necessary based on this test should be taken up for KAPP-1.

K.Natarajan
28.4.92

I agree. This would be done in KAPP-2

G.Ghosh
29.4.92

not meet with design requirements. They also state: 'The note also reveals apprehension regarding proper functioning of ECCS, else, the note would not have mentioned integrated testing of KAPP Unit-2 and possible retrofitting in KAPP Unit-1."

The sources further reveal that the NPC has permitted loading of fuel in KAPP Unit-1. This implies that the uranium rods and the heavy water are already loaded into the system, making it impossible for AERB to now demand compliance of the ECCS integrated test. 'The KDSC and the chairman, AERB, have overlooked the serious lapses in commissioning ECCS by the KAPP site management, by permitting the NPC to load fuel in KAPP Unit-1. No regulatory body anywhere in the world has displayed such gross lack of concern for safety by condoning inadequate testing of ECCS, the failure of which may lead to the severest nuclear accident," it was held.

The chairman of AERB, S. Soman, explained his stand during two hours of discussion with this reporter on Thursday, (23.7.1992) followed by questions submitted in writing and their reply similarly forthcoming. During the discussion, Soman revealed that "the process of criticality (for KAPP-1) has already started, and the review committee is going through that." Kakrapar Unit-1 is a replica of other CANDU type reactors, hence "safety is ensured". "We are not here to answer why it (integrated testing) has not been done, it is not our business. But we have to be satisfied that all tests have been properly done. They have to submit results of all experiments and if they are satisfactory, then only will our permission be given," he added.

When shown Natarajan's letter, Soman said he would confirm the specific position with Kakrapar Unit-1, but nevertheless defended "individual testing of the ECCS components", holding that "integrated testing could not be simulated." It is accepted that you test part by part, and be satisfied that all systems are normal. Integrated testing is by checking the design and indirect measurement, you look at it part by part. During the process of reviewing these, opinions (as by Natarajan) are being expressed."

Subsequently, in a written response, the AERB avoided use of the words 'integrated testing', as pointedly referred to in the written questions, and instead referred to "complete" ECCS tests. "Complete ECCS testing was tried out Narora 2 before it went critical. Some deficiencies observed during the tests were rectified and necessary tests to ensure the performence of rectified system carried out. ECCS at KAPP-1 is identifical to the one at Narora-2," it stated. Asked about "integrated ECCS test" at KAPP- 1, AERB said, "Complete ECCS has been tested for its functional performance at KAPP-1 before addition of heavy water to the PHT system." Asked about AERB's stand on testing ECCS before the reactor went critical, and whether "in toto testing" is an essential requirement, it replied, "ECCS should be checked for its performance before a reactor goes critical. Any deficiencies observed during the tests have to be corrected and functional checks carried out to ensure that the system functions as per safety requirement."

Meanwhile an independent expert, Shri R. Ashok Kumar, an electrical engineer and authority on energy audit, holds the failure of the CANDU type reactor design as serious. He questions why the Moderator Inlet Manifolds at MAPPS (Kalpakkam) broke in a 1990 incident, and whether it was a "remote possibility" at Narora and Kakrapara, thereby questioning the sound working of the Cold Moderator System in the event of LOCA under ECCS failure. "Inability to conduct full scale tests needed for LOCA, ECCS and Cool Moderator Inlet Behaviour raises serious questions over solution to the safety problem itself," he said.

Rupa Chinai
The Sunday Observer 26.7.1992

So That Others Might Live in Peace

Navstar Satellite Disarmed

Just before dawn on Sunday, May 10, 1992 Keith poller and Peter Lumsdaine entered Building 86 at Rockwell International's world headquarters in Seal Beach, California, where they partially demolished a NAVSTAR-GPS global targeting satellite and parts of the dust-free "clean rooms" where these satellites are assembled. NAVSTAR-GPS ("Global Positioning System") is a far-reaching military "force multiplier" program, half-way to full deployment. Already in partial use, NAVSTAR will increasingly provide extremely precise data on the exact position, altitude and velocity of any designated object to U.S.military, police, intelligence or high-level corporate user, with less exact positioning offered as a spin-off benefit to the commercial/civilian sector.

If NAVSTAR program is allowed to go forward it will increasingly: guide counterinsurgency assault teams and gunships on search-and-capture or search and-destroy missions against Third World resistance movements, "illegal" refugees, and indigeneous communities in previously remote rain-forest/mountain sanctuaries or urban slum back alleys-day or night anywhere on the planet; and

- provide the Pentagon's nuclear missiles with the unprecedented accuracy needed only to start and win World War III through a catastrophic first-strike on the nuclear deterrent forces of any future rival, especially a resurgent Russia or Eurasian alliance.

NAVSTAR also greatly facilitetes corporate-state surveying and mapping of every remote wilderness, desert, rainforest and indigenious nation on Earth for "resource" exploitation and control. In the war against Iraq, NAVSTAR guided much of the bombing campaign, including B-52 launched cruise missiles destruction of Iraq's civilian infrastructure.

Axing The Satellite

After slipping into Rockwell's fenced and patrolled Space Systems compound with tool boxes, the two unarmed saboteurs changed from black apparel to regular work clothes with Rockwell-logo shirts and fascsimiles of company security badges, which they were wearing when apprehended in Building 86.

The steel mesh reinforced windows to one NAVSTAR "clean room," containing seven uncompleted GPS satellites, were removed with an ordinary wood splittingax, introducing un filtered air as well as specks of glass and metal into the dust-free environment, potentially causing problems for the precision satellites being assembled there. The door of a second clean room was meanwhile broken open and one NAVSTAR inside was struck about 60 times with another ax. This completed satellite, awaiting shipment to the pre-launch facility at Cape Canaveral Air Force Station, has had to be completely disassembled by Rockwell technicians to assess and repair the damage. To date, damage is estimated to be at least $ 5.5 million. Rockwell and government sources reportedly say this figure is expected to rise as the investigation proceeds.

Armed security and other Rockwell employees were present in the building and within a few minutes Lumadaine was seized at gunpoint. Kjoiler was tackled and choked unconscious, later requiring stitches over his blackened left eye. Before being assaulted by security guards, both clearly stated they were unarmed, and they neither threatended nor struggled with anyone.

Kjoller and Lumsdaine, who issued a three page statement after the action, chose the name The Harriet Tubman-Sarah Conner Brigade" for their nonviolent direct disarmament effort. The name honours the 19th century "Underground Railroad Conductor" and the fictional nuclear resistance fighter of the popular movie *Terminator II:Judgement Day.*

A Call To Conscience

Their statement affirms:

"NAVSTAR" is the space-age mechanical bloodhound of the world masters, guiding their hired guns as they track down the rebellious and runaway slaves of the corporate state, from the mountains of South and Central America to the back alleys of South Central Los Angeles. And it is also the real-life Skynet/Deathstar of our culture's movie theater nightmares, propelling the Earth's peoples toward an automated global holocaust of nuclear fire and darkness.

Kjoller and Lumsdaine are from Santa Cruz, where Kjoller earned a degree in sociology from University of California and produced a radio program for the University radio station. Lumsdaine lives with his four year daughter Lucy and is a member of the local Pax Christi group. He has worked for two years as the coordinator of the Silicon Valley's Interfaith Peace Coalition. Both have been actively involved in previous civil resistance movements in the area.

In a letter to the judge, Lumsdaine explained the factors that influenced his decision to act:

"Lucy and I are very close emotionally and my devotion to her is very strong... I of course realised that the action I took might result in a substantial period of physical separation from Lucy, a fact that deeply concerned me. Nevertheless, I took this action just as other devoted parents in various lines of work—international relief workers, soldiers, journalists, diplomats and even clergy members—find it their duty in conscience to take certain risks in their line of work which may result in extended separation from their children and families or in capture, injury or death. I strongly believe that people, including parents of young children, have a responsibility to take serious risks at times: to defend children from the socio-economic, ecological and military violence that is inflicted on them in many areas of the worla; and to defend all children, including their own, from the threat of global nuclear holocaust, a threat which remains perilously real notwithstanding the currently fashionable but short-sighted conventional wisdom.

Under current sentencing guidelines, Kjoller and Lumsdaine are expected to receive a sentence of around three years, plus possible supervised parole, fines and restitution.

Kjoller and Lumsdaine request that people support them by:

- Resistance organising against NAVSTAR and the corporate war machine.

- Short letters of support/encouragement to Lucy, Peter Lumsdaine's four-year-old daughter, c/o Jean Peterson P.O.Box7061 Santa Cruz, CA 96061 U.S.A.

For more information, contact:
The Tubman-Conner Brigade
c/o Maxine Ventura
P.O.Box 11645
Berkeley CA 94701
U.S.A.

The Nuclear Resistor
June 19,1992

Et Tu Brute

Can Nuclear Pay Its Way In India?

Nuclear Engineering International is an industry journal, and that is precisely why the following article is important. This is the first time that I have come across a piece in an industry journal that so clearly talks about the hidden subsidies enjoyed by nuclear power. We are reproducing the article in full, without any editing.

India's economy is to a great expnt centrally planned, and electricity supply, like other essential industries is nationalized and subsidized. All sources of supply are supported — coal, for example, is transported by rail at less than cost price — but the government decides which sources should be favoured. While Rajiv Gandhi was enthusiastic about nuclear industry, the new administration under Narasimha Rao has other priorities, and under pressure for, inside and outside India it is reducing subsidies and introducing some market policies.

At first sight the India nuclear industry seems to be moving successfully towards a commercial footing. Responsibility for plant operation and construction was devolved from the Department of Atomic Energy (DAE) to a quasi-commercial company, Nuclear Power Corporation (NPC), in 1987. The new arrangement allowed NPC to obtain provate financing, make its own investment and operation decisions and retain any profit. According to NPC the company has had a good record, making profits of up to Rs.750 million in its first three years and selling power at prices similar to those of coal fired plants. Such figures would give NPC a rate of return of around 11% — a considerable achievement when the average rate of return of India's nationalized industries is barely above *1%.*

NPC is able to keep its prices low and record a profit because of continuing support from central government. It is subsidised in a number of ways:

Fuel Price:

NPC buys its nuclear fuel from the Nuclear Fuel Complex (NFC), another quasi-commercial company of the DAE. If all the production costs were taken into account, fuel bundels would cost around Rs 1,000 each. Instead, the fuel is "hired" from NFC at an administrative price set by the DAE. In 1989/90, NPC's total fuel bill, including the first load for Narora-1, was Rs 21.6 million. The price of fuel, however, is now being gradually increased to a more representative value.

Heavy Water Price:

The true cost of NPC's heavy water would be around Rs 4,000/kg. In practice, it is assumed to be a non-depreciating asset and is leased to NPC. The company's total heavy water bill in 1989-90 was Rs 18.7 million.

Research and Development:

NPC has no research and development capability of its own, although a small laboratory is planned. It relies on DAE facilities at the Bhabha Atomic Research Centre (BARC) and elsewhere. These DAE facilities provide a variety of services for NPC: they provide experts for planning or problem solving groups; they design and manufacture high technology or one-off equipment that cannot be supplied by Indian industry; and they are always available as a reservoir of expertise. The DAE budget for research and development totals Rs 2,100 million. The budget covers more than just nuclear research and development — BARC's work, for example, extends to food irradiation, new alloys and electrical goods — but only now is the DAE's resarch for NPC beginning to move to a contract and payment basis. Previously, the two organisations continued to work on the informal basis that was in operation when both were run directly by the DAE.

Waste Disposal

Althogh NPC, through each plant, deals with its own low and intermediate level waste, it has no responsibility for spent fuel. This is stored at the plant until it can be moved to BARC or another future site for reprocessing. None of the costs are borne by NPC: research and development for reprocessing technology is carried at BARC and it is assumed that the cost of transport and reprocessing of fuel, as well as any subsequent decommissioning costs, will be covered by the value of the plutonium recovered.

Risk Insurance

NPC bears none of the costs of insuring against the risk of a nuclear accident or of compensation in case of such accidents — this is assumed to be a government responsibility.

Rajasthan Atomic Power Station

The two unit plant at Rajasthan is regarded as a prototype and is still owned by the DAE. It is operated for the DAE by the NPC.

Indian Plant Derating

- Tarapur: 2x220 MW BWR

Startup: 1969
Derated to 160 MW due to corrosion in steam generators and damaged generator rotors.

- Rajasthan: 2 X 220 MW and 2 X 235 MW PHWR

Startup unit 1 1973, unit 2 1981, units 3 and 4 due 1995
Units 1 and 2 derated to 100 MW due to leaks in calandria and shield wall (now mechanically sealed) and cracks in turbine blades.
Units 3 and 4 are expected to be derated to 220 MW.

- Madras: 2X235MWPHWR

Startup unit 1 1984, unit 2 1986
Operating at 175 MW following failure of inlet manifold. Derating likely to be permanent.

- Narora: 2 X 235 MWPHWR

Startup unit 1 1990, unit 2 due late 1991.
Construction was delayed because of backfitting and testing new safety systems.

- Karkrapar: 2 X 235 MW PHWR

Startup unit 1 due early 1992, unit 2 due late 1992.
Expected to be derated to 220 MW.

- Kaiga: 2 X 235 MW PHWR

Startup due 1995
Expected to be derated to 220 MW

Investment

As a commercial company, NPC is expected to raise one third of its financing from internal resources, one third from private borrowing and one third from government funds. At its healthy rate of return, NPC has been able to attract private funds but its internal resources are low and government funding has been raised to 50%. Nor are these the only subsidies. In the past, the government has been willing to compenate NPC directly if production costs cannot be met by the electricity price.

Assets

Nevertheless, if the Indian nuclear industry has commercial power production as its aim, it does now have some of the right ingredients:

A Standardised Design

The six units currently in operation have very different designs and have been plagued by problems. In contrast, the next 12 units—Narora 1 and 2, Rajasthan 3 and 4, Kaiga 1 to 6 and Kakrapar 1 and 2 will have a standard design, referenced to Narora 1, which incorporates all post Three Mile Island (TMI) upgrades.

Faster Construction

NPC aims at construction times around six years for the current pressurised heavy water reactor series.

A Qualified Industry

When the Indian nuclear industry was isolated in the 1970s, Indian companies could not supply components or equipment qualified to nuclear standards. The DAE and more recently NPC, have worked to upgrade local industries and now, although components cannot be bought "off the shelf," two companies have "N" stamps, and NPC has the security of regular supplies.

Indigenous Suppliers:

Early plants were held up when components from overseas were unobtainable. For example, the startup of MAPS 2 was delayed for ten years by a shortage of heavy water. Nearly 90% of the components are now Indian made, and mechanisms are in place to allow the DAE to work with industry where specialist equipment is required. Using local supplies also helps in conserving foreign exchange.

Cheap Manpower

Manpower cost in India is half that of Western countries, although a much smaller proportion of the work is automated.

Indigenous suppliers and the low cost of staff have already contributed to the low costs of Indian plants, according to P.K.Iyengar, Chairman of the Indian Atomic Energy Commission. Capital costs of Indian plants were around Rs 25,000 per kilowatt ($l,000/kw) and running costs are also low.

It remains to be seen whether NPC can make the most of its assets. Indications are that although NPC, and not the DAE, is making operating decisions, commercial thinking is still a long way off. Western suppliers, for example, have found delivery dates for their components put back as construction schedules are stretched.

In the medium term NPC is going ahead with plans for a new 500 MW reactor, although estimates are that capital costs and electricity price will be more than double those of the 235 MW series.

Commercial electricity production is not the only goal of a nuclear power programme such as India's. The implementation of such a programme brings with it a measure of international prestige, and associated research and development can give great benefits in "spin-off' technologies. But the overriding concern as Iyengar pointed out in a recent lecture to the Indian Institution of Engineers, is that "a minimum level of electricity production is essential for our survival."

The danger for the nuclear industry is that it may overestimate its importance in meeting that objective. Even with India's uranium and thorium resrves and with the problems associated with fossil fuels, unless nuclear power can show some commercial advantages, in a harsh economic climate it may be all too easy to replace the nuclear 2.5% with simpler cheaper technology.

Janet Wood
Nuclear Engg International
December 1991

Die, Brother, Die

The Atomic AIDS of Semipalatinsk

"Come, dear guest from abroad, don't ask too many questions, but do take more pieces of the ram. We have slaughtered it for you." The faces at the dining table shine with vodka and fine speeches: the plates are filled with mutton and noodles; the Chairman of the district Soviet, the Mayor of Dolon and all the other dignitories of the village beam with delight.

"Come, dear guest, don't be too inquisitive, drink the glass empty, because you are in Kazakhstan: And the best thing to do is to pour another glass down yourself, because you are at the "polygon", the testing range."

Vodka has always been a good antidote for radiation, says the Chairman of the district Soviet, without smiling. In the early fifties, when the first bombs were dropped, the army occasionally gave orders to distribute hundred grams of vodka to the farmers around the Polygon.

During the explosion the school children had to line up in front of the school at the hour of the exciting spectacle and look up to the horizon. A red ring grew in the sky, became larger and larger, sank to the ground, became whiter and whiter, grew legs, penetrated into the soil and rose again as a majestically ugly mushroom cloud.

"Look at me, dear guest, I am 45, boasts the Chairman, but don't I look younger? The atom dose it, it keeps us young."

In the course of the years between 1949 and 1989 the red ring in the sky glowed and turned itself into the mushroom cloud 166 times; the bombs exploded 343 times underground and made the windows rattle.

*"Take more mutton, dear guest, have no fear; our village supplies meat and vegetable to Semi*palatinsk, and people are ofcourse still alive there!"*

500,000 Kazakhs live around the testing range. Fallout equivalent to 15,000 Hiroshima-bombs have rained upon them. The army generals were playing Russian roulette with the people: The direction of the wind determined if the radioactive cloud would sail over the villages in the south, north, east of west.

When he once travelled abroad with his family, says the Chairman at the table, the Russian customs officer asked him, after looking at his passport, doubtfully: "What, you are from Semipalatinsk? But your children look so healthy?'

Their native place Dolon is in the north of the Polygon; opposite, on the other side of the atomic landscape, is Kainar. Usually the wind blew in this direction.

Whenever Danletkali Kodjajew, a hunter from Kainar, saw the atomic mushroom proliferating in the sky, he drank snake's blood, mixed with horse milk, and looked forward to hunting. The wild goats, deers and wolves were disturbed during every explosion, making them an easy catch. But this 62 year old man has not got hold of a hamster since long, even swallows have vanished from his hunting grounds.

When the earth shook, he knew, that somewhere on his next expedition he would come across a new hill or a new valley.

Kodjajew wanders even now through the hills, for hunting, thought it is prohibited since three years to eat that meat. Since even the soldiers give him hunting orders, the game should not be so dangerous, he hopes. Once in a month he could eat meat, the officers tell him, it doesn't cause any harm.

He should not talk too much, calls out Kodjajew's wife from the bedroom into the passage. "She is still afraid", he confides in his husky voice. Till three years ago, it was actually prohibited to talk about the bomb." He beckons us over to the kitchen of his hut.

His son is standingon the kitchen bench and covers his ears. He stares at the bulb of the ceiling light. He ignores us. Kodjajew ignores him. His son is insane, the father tells us later. Every child in Kainar lacks something, either the fingers or the arms, either the speech or the sense.

Recently Kodjajew tracked down a four meter long snake under a rock. It was without the hindquarters.

Samakal, the son of the hunter, is 32 years old. He suffers from congenital moronism. If this son doesn't take the medicine that quietens him down regularly, says Kodjajew, he bahaves like a rabid wolf. Samakal cowers in the comer of the kitchen and pulls at his thin goatee beard. He repeats every sentence of his father like an echo, without locking up.

"Only drunkards get such sons", the doctors used to abuse Kodjajew. He never drank, no vodka, no beer, only occasionally kwas. "I am a simple man", says the hunter, "but I can build a car". His carriage is parked in the yard. Kodjajew has built wooden bodywork around the chassis of a motorcycle. His car has space for two persons, has a big luggage aarea and runs 60 km per hour.

Samakal follows us, apparently indifferent, to the yard. He kicks a cow that blocks his sight, at the hind leg, till he trots off.

The house wife has woken up and calls for a brandy. She is sitting on her bed, under the picture of a lion, and writhes with asthama attack. She is ashamed because she is not keeping well, says the 62years old. The illness has wrickled her face like that of an 80 year-old.

She nursed her son for such a long time, she laments, till she herself feel ill. Samakal repeats her words. He sits on his bed, under the poster of Arnold Schwarzenegger, and swings his body to and fro.

Both patients are now nursed by the daughter. Surrounded by illness all her life long, she decided on her early age itself to become a medical doctor. Now she is crushed by the ubiquitous infirmity in Kainar. In the neighbouring house 50 years-old Nurkan Suneejewa, who can walk only on crutches, is suffering. Her sister cannot even get up any more.

Fifteen beds are available in the small hospital of the doctor, but atleast 100 villagers need treatment every month. 201 out of 3500 villagers have already died of cancer.

The number of deformed children is growing, the most serious cases perish anyway shortly after birth. Their nember tripled in the last three years. Every fifth child is born dead.

Japanese doctors who visited Kaniar and measured the radiation, told their colleagues: "You can't live here any more."

In the neighbouring village Sarshal, about 100 kilometers away, a highly dangerous quantity of the nuclear fission product Strontium 90 was found. It destroys the bone marrow and thus prevents the formation of blood. The radioactivity in the blood, urine and excrement of the farmers is 120 times higher than expected due to natural radiation.

Leukaemia, anaemia, asthma: hundreds of villagers have fallen ill and perished. 11ldied of cancer, 97 died by hanging. Only the strongest farmers in Sarshal, about 23,000, have survived the radiation; and the wisest among them gather occasionally in the council of elders to record any new signs of threat.

The gases leak out of the 'borehole 918' near the village which the military maintained in the steppe, in order to measure the convulsion in the bowels of the earth. The earth is screaming", say the elders. A shepherd with a broad for cap says that a jeep with two soldiers approached the borehole with gauges. They fled form the spot, as if hounded by wolves". Another describes a huge toungue of fire sticking out of the 'borehole 1010'. It was extinguished thrice.

Muratchan Korganbajew, the Chairman of the village committee, has found fresh deep holes and suspects that new tests are being planned or nuclear waste is being dumped secretly.

Korganbajew, 54, suffers from a terrifying growth of extremities: the hands, the legs, the head and even the tongue swell up. As if someone is pumping them up.

Melgis Metow would be happy if someone would give attention to his suffering. He is just weak and ill. He stutters, he cries, he looks tired; but this is the condition of many 54 year-olds in Kazakhastan. Metow's left eye flutters in the rhythm of a wild melody when he talks about his life as a soldier. He was forced to keep quite for 30 years, was intimidated by occasional visit of the KGB and by his faith in Soviet power.

The distance between him and the nuclear mushroom was 15 kilometers when soldier Metow first experienced the nuclear explosion. It was so bright that he was afraid, he would go blind Inspite of his dark glasses; when the shock faded away, the view of the man-made natural spectacle excited him. He saw a whitish-yellow ball that turned first into orange and then bright red, and grew and grew, till it filled the whole sky. A huge, white smoke cloud rose from the earth. Its surface blazed in shining red; a thick stem grew in slow motion from the bottom till the cloud stood majestically over the steppe...Deathly silence.

Metow saw the explosion storm drawing near, saw an invisible wave press the grass in the steppe, felt for seconds the heat of campfire inspite of the cold of the autumn, just before he pressed his head on the earth.

The wave shook up Metow and chased him into the hut where he lay down at the door. Windows, though open, shattered.

Half an hour leter he and the other 59 soldiers of the special pioneer unit No. 52605 were given cotton overalls and gumboots. They got breathing apparatus and the order to move towards the centre of the explosion.

In the months prior to these moments of destruction, 20 000 soldiers constructed the four storyed buildings, laid the pipes, parked the cars, constructed the illusion of a town. Now the special unit inspects the ruins in order to measure the power of the destruction; they collect the dosimeters which they had installed earlier, and also the chicken, pigs and sheep which they had released.

Cars and tanks are burnt down, the houses have collapsed, water flows out of the broken pipes. The town is as if it were painted with a black paste. Even the underground metro is damaged, but it still runs.

Metow and his comrades work their way gradually up to the centre of the inferno. Their goal is to reach a bunker which they had, before the zero hour, crammed Ml with gauges. A pin, attached to their clothes, measure the absorption of radiation without they themselves being able to understand the recordings.

Only 30 years later is Metow being informed, after he repeatedlly requests for a certificate, that he had been exposed to radiaton of 3.05 roentgen for 41 days. Metow doesn't trust that paper. After all a nuclear bomb was exploded every second week in the two years of his military service during 1961 and 1962.

In the last minute panic, the scientists and the generals let the sky over Semipalatinak glow because, from August 1963, atmospheric nuclear tests were forbidden.

The Chinese and the French continued to bomb overground, the Americans and the Soviets blasted henceforth under the earth. Together, they have triggered off 1800 nuclear explosions till today and spread radioactivity equivalent to 40,000 Hiroshima bombs on the earth. These radiations will, according to an international study, lead to the death of 430,000 people of cancer by the year 2000.

One third of the 343 underground nuclear tests in Kazakhastan did not remain under the earth. Radioactive clouds emitted from the brusting rocks and spread over the villages.

The nearer they live to the source of fright, the sooner people commit suicide. In the non-radiated areas of Kazakhastan, 2 out of 10 000 people hang themselves. In the area 160 kilometers from the testing range, the suicide rate is 24; at 120 kilometers distance it is 47 people, and at a distance of 40 kilometers, 80 out of 10 000 Kazakhas commit suicide.

Many people like Arnold Steiger fear that they have cancer. The farmer from Sarshal hanged himself three years ago. His father, George Steiger of German origin, laments in the council of the elders that military have not even paid for the damages of the buildings which their bombs have caused.

Each time, the roof of his house was swept away by the shock waves. Steiger was staying only three kilometers away from the Polygon till last year. Only once the soldiers dumped ten asbestos sheets, some cement and a few planks in front of his hut.

Every furrowed face in the council of the elders expresses fury. But Korganbajew, the Chairman of the village committee with the terrifying growth of extremities, shouts it out, the contempt, so loud as if his vocal chord also grew in the course of the decades by radiation.

The villagers were always being examined thoroughly: the farmers from Sarshal in Semipalatinsk were being investigated for many days in the secret hospital No. 4; the medical personnel were sniffing around in the village for weeks; the gauges were constantly registering the radiation,—"but we, the people who live here, don't know the whole truth about ourselves."

The snow-covered landscape between Sarshal, south of the Polygon, and Dolon, in the north, appears from the helicopter like a natural park. Wild horses run through the steppe, sheep look for food, wolves draw their circles. But some or the other hill appears to be artificial, as if man and his bomb have modelled them. And ofcourse the seas - neatly circle precision work.

At 50 degree north latitude and 79 degree east longitude, where the frozen rivers Shagan and Ashtshyssu meet, one finds the most beautiful creation of these lakes. The crystalline white snow-cover glitters in the sun, the brown white jagged edge looks as if chiselled by the diamond cutter.

"1004" is the name of this pearl. It has a diameter of one half of a kilometer and is 100 meters deep. Created on 15th January 1965 at 5.59 hours through a nuclear explosion that had a strength equivalent to nine Hiroshima bombs. The sea is the monstrous product of that mind (which existed at that time not only in the USSR), which thought that man could construct canals, lakes and ports with nuclear power.

120 "peaceful" bombs were exploded in many parts of the country between 1963 and 1988 in order to divert the rivers, to tap oil fields or to creat underground caves, - the dictatorship of the proletariat carrying forward the class struggle against nature.

When the atmospheric nuclear explosions were banned in 1965, soviet scientists invented a good excuse: the experiment 1004 has "by mistake" drilled through the earth surface. Iodine 131, Caesium 137 and Strontium 90 were blown all over the steppe.

The radiating lake "1004" served later to water the surrounding meadows and for fish-farming. The anglers appreciate the catch which they fish from the water - inspite of presence of Strontium 90, one thousand times in excess, compared to non-contaminated water.

This fission product requires 29 years to reduce itself to a half. More than half a million people around the Polygon have absorbed this and other radioactive particals through respiration, food and skin. They cause cancer in the body and destroy the genetic make-up; continuing the process through the next generation and the generation thereafter and so on...

In the hospital of Dolon, three generations of infirmity are being treated. The 71 years old Balanowa suffers from gullet cancer, the 42years old Aldishewa has bronchiatic asthama and Olga, 14 years old, is struggling with nephritis.

Olga has never seen an atomic mushroom in her life, but she knows well how it looks like. It is always around her since the time she could think. And it is growing, from the moment she suddenly got fever two years ago and had to urinate often.

The kidney pains come in longer streches and force her to leave the school and stay in the hospital. The pain is unbearable without medicine; at present the hospital has no medicine; Olga couches curled up in her bed.

Olga's parents were children when, about 100 kilometers away from Dolon, on 29th August 1949 at 7.00 hours the "RDS-1" exploded. RDS—an abbreviation for "Rossija delajet sama" means: Russia does it independently. The Americans call the first Russian nuclear bomb "Joe 1" affectionately, after Stalin.

Its explosive force: 20 kilotonnes, about one and a half of the Hiroshima bombs. Hight of explosion: 38 meters. Wind speed: 70 kilometers per hour.

The nuclear cloud, expanding in the low altitude, reached Dolon in about 90 minutes. The radioactive fallout rained for three hours on the village. Olga's parents belong to those 70 000 people who were exposed to the gamma rays.

Olga was never well in her life. She had pneumonia before she got nepritis, had skin rash before pneumonia, and before the skin rash... She has "allergy to her own body", the doctor says and he has many such young patients.

Every second child in the radioactive contaminated areas suffers from chronic diseases; the immunisation system of half of the population has "reached the lowest norm", says a government report;

40 percent of the boys are too ill or mentally disturbed to do military service; new born babies have very few helper cells in their body, like the AIDS infected babies.

The children of the nuclear-test-generation inherit the nuclear AIDS from their parents and grandparents; 60 percent of them have been identified as having defective chromosomes. A Kazhakhi doctor had diagnosed right in 1958 the defect in the immune system, caused by radiation. He called it "Kainar Syndrome." He was forced to stop his study.

In the strictly shielded hospital No 4 in Semipalatinsk, people were examined but not treated. More than hundred medical doctors examined about 50,000 victims of radiation since 1961, without treating them. When someone died, he never died of radiation, but always of influenza or of heart failure. The chief of this 'hospital' tells about the collaboration: The Soviet Government, the army chiefs and unfortunately also some scientists were not merely interested in the hydrogen bombs, but they wanted the nuclear tests to create the conditions closer to that of a nuclear war".

Olga, Altishewa and Balanowa will not survive this Soviet nuclear war against its own folk. The 71 years-old vomits all that she eats; she has metastasis in the lungs. The doctor in the hospital of Dolon has not even morphium to make her death easier, he needs an inhalator for the 42 year-old asthmatic, and for Olga painkillers and somewhere a dialysis facility.

The malicious effect of the nuclear tests is the delayed, quite death, laments the doctor. 'Semipalatinsk' does not have the support of a lobby in the world as 'Chernobyl' has. A few injections occasionally, sometimes a few tins of tomatos, that's all what has reached this secret disaster area from the international aid for the new States.

Since Kazakhastan has become an independent country, this hospital receives less medicine than ever before, criticises the doctor. He shows us the disheartening medicine cabinet, though the chairman of the district soviet nudges him to shut up.

"Come, dear guest from abroad," the chairman says, you are in Kazakhastan, don't question so much, let us have our meals. "

He has choosen the house of a family with three healthy children to offer the guest mutton with noodles.

We won't show him the midget and the bigwig twins anymore, whispers the Chairman to the village soviet. He thinks, our interpreter did not hear him.

"Come, dear guest, take a piece of the fish. The round tea is safe. And its fish too. I myself have taken bath in "1004". And my son too."

Sasha, the interpreter, sings a song, the song of a dying Cossack. Black crow, fly. bring this ring to my wife and tell her: I have merried another. I have married death.

"Dear guest, drink and don't enquire too much, eat the apples from the Polygon. Don't they appear around and nutritious?"

A patient in the hospital had asked us: "Had that all been a natural disaster?" He pulled his shirt up and showed us the tumours on his back as thick as a fist. "I will catch those guys," he hissed, "even if I have to dig them up from the grave."

Cordt Schnibben
Der Spiegel
4th May 1992

Translated By: Arun Kotemkar

ALTERNATIVES

Untying Aids Knots in Nepal

Nepal's new found freedom through its discovery of democracy has proved popular with the 'free world'. In fact, the donor community's latest obsession with its newest tool for aid conditionality, the requirement for recipient countries to demonstrate 'good governance', probably helped to precipitate resolution of the pro-democracy struggle of 1989/90, so as not to threaten Nepal's access to the aid coffers. Few countries are so tightly strapped by foreign aid than this small, mountainous Kingdom and the established overseas agencies don't escape with a clean slate.

Nepal's options for power generation clearly illustrate many of the problems encountered in the aid game. As the country has no fossil fuel resources of its own, renewable energies have been seen as its panacea. The massive, untapped potential of the 6,000 streams and rivers that rush down from the Himalayas point to hydro-electric power as the obvious choice.

The former Panchayat Government, to its credit, had not dismissed the idea of small-scale, decentralised energy production. In 1984, it delicensed micro-hydro power (ie schemes generating up to 100KW), allowing villagers to create their own electricity supply and charge their own rates, independently of the Nepal Electricity Authority (NEA). The subsequent launch by the Agricultural Development Bank of Nepal (ADB/N) of a programme to subsidise village-level hydro schemes by upto 50% enabled people to capitalise on this new opportunity. Today, more than 650 units which provide power for agro-proosssing and a further 70 units which generate electricity have been built privately to service village communities.

The cost of NEA's micro-hydro projects averages around $8,000 per kW produced. Village owned and ADB/N subsidised schemes, on the other hand, have averaged about $1,500 per kW. This has been possible because the village entrepreneurs and Nepali hydro companies use appropriate technologies, local labour and components manufactured in Nepal. The connection cost works out at about $160 per household for lighting and $320 to generate enough power to cook. The government would never be able to elecrtify rural households at these rates. However, where there is a determined community that is willing to pay half the costs, government investment can be a fraction of the grid connection cost.

There is no shortage of motivation in the villages. Mustang district for instance, which lies in the rainshadow of the Annapurna Himal on the Tibetan plateau at a height of 3400m, offers a particular challenge for hydro schemes as water is scarce and irrigation is the first priority for water supply. Nevertheless, a number of successful hydro schemes have already been installed.

Micro-hydro engineer Bikash Pandey surveyed many of these sites some four or five years ago. According to Pandey, the drive and determination shown by these communities is quite remarkable. "When I undertook the initial survey for one of the villges, Muktinath, they insisted that I estimate the cost of the scheme there and then. After considerable discussion between the elders and the rest of the village, they told me that they wanted to go ahead. I returned to Butwel, expecting their initial enthusiasm to wane once I'd disappeared from the scene, but within three weeks, they were on my doorstep, having raised the ftill cost of the scheme, NRs 450,000. In the neighbouring village, Jhong, the community raised an astonishing NRs 192,000 within a week. When you consider that the country's per capita GNP is mere $180, the real significance of the investment becomes apparent."

Such is the drive for electrification, the nine independent companies in Nepal which specialise in building and installing micro-hydro plants are struggling to keep up with the demand. It is tempting, therefore, for Nepal's new Government to speed up the process by importing equipment or accepting foreign equipment offered as 'aid'. Government agencies are already under pressure from foreign donors to accept donations of equipment, usually inappropriate, or to buy from specific foreign suppliers in return for other goods and services. This poison pill of 'tied aid' may speed up the process initially, but will ultimately lead to disaster. Unable to compete with 'free' foreign machines, Nepal's fledgling micro-hydro industry will wither away, taking away with it the expertise needed to maintain and repair the equipment. Furthermore, in the long run, the upkeep of even 'free' imported machines will prove to be more expensive as all spare parts will have to be bought from abroad.

Attempts to set up a 100 kW hydro scheme in Sikles, a village of 250 families in the Annapurna area, have come up against this problem. Funding has been secured for the proposed scheme from USAID on the condition that all the equipment used is US-sou reed. Quite apart from the business this takes away from the local manufacturing industry, there is no equipment produced in the US which is appropriate for the local condition. And, as US equipment is unfamilier in Nepal, it is harder to repair and maintain. In Eastern Nepal, 40 off-the-shelf Japanese machines have already appeared, and there are fears that more are on the way. There are also examples of Chinese turbines in the 200kW-lMW range that have been dumped on the market for less than the price of the steel used in their manufacture.

Another example of misdirected aid is a Finnish-funded electrification scheme near Pokhara. This grid extension programme, which is being provided 'free' to the villages being wired up, costs $4,000 per installed kW, just for power distribution. A micro-hydro scheme recently commissioned in Ghandruk village cost $1,500 per kW installed for the whole scheme, from diverting the stream to putting in the light bulbs. The scheme even imported specially treated timber transmission poles from Finland, with the excuse that it prevented deforestation in Nepal. The most scandalous aspect of the Finnish scheme is not extortionate cost, but the expectations that it raises. If one village gets wired up for free, what hopes is there in encouraging another to invest time, labour and money in setting up its own scheme?

In the UK, tied aid is suposedly limited on the ODA's Aid and Trade Provision (ATP), which represents more than 10% of the total aid budget. However, much of the rest is also tied, but in a more camouflaged form. The notorious £65 million Westland helicopter deal with India, which was no more than a straight subsidy for an ailing British company, rather than a project designed to enhance the development of the country, came from the main aid budget rather than ATP. In 1986, 79% of the total bilateral aid was spent on UK goods and services, and the situation is similar for many other donor countries.

Tying of aid is not always a deliberate move to protect a donor country's own interests; it sometimes stems from a fundamental misunderstanding of what 'aid' means. In his recent book reviewing of the last 25 years of development, *Mastering the Machine*, Ian Smillie points out that technology transfer is one of the greatest wrongs in the misguided lexicon of development. "It implies", according to Smillie, "that technology is something that exists outside of society. It suggests that technology can be handed across a desk, picked out of a pattern catalogue, or shipped by jumbo jet from the North to the South along with some 'technical assistance' to get it going."Technology transfer should mean the exchange of the capability, and the thinking behind the capability, both to enhance existing capacity and to support the recipient countries in their own design and development efforts, i.e. 'know why' as well as 'know how'. It is better to start with small initiatives and slowly build up capability. Five years ago, the largest Nepali-made turbine produced about 25 kW in power; today the same industry makes turbines which generate 250 kW. One of the mandates of the UN Conference on Environment and Development (UNCED) is to assess 'the transfer of environment tally sound technologies to developing countries'. The remit itself indicates that the process is seen to involve only one-way traffic. Unlike its largescale counterparts, micor-hydro is one of the greenest forms of energy on the planet, and hence is an obvious candidate for technology transfer. There is no doubt that micro-hydro could provide a truly sustainable power supply for thousands of communities around the world; in Nepal it has the potential to provide some 80% of the country's needs. While Nepal is way off target still, it has come a long way towards developing a decentralised system for power generation. However, its success and sustainability is dependent on nurturing the country's fledgling manufacturing industry.

That means saying 'no' to tied aid. If it succeeds in doing so, and frees itself from internal bureaucratic barriers, Nepal could have the last laugh as it watches the rest of the world scramble for the last of the fossil fuel reservers.

Janet Bell ITDG
Hydronet 1/92

GEOTHERMAL ENERGY

Geothermal energy is an energy resource with cost, reliability and environmental advantages over conventional energy sources. Geothermal energy contributes to both the energy supply, with electrical power generation and direct-heat uses, and to reduced energy demand, with savings in the electricity and natural gas through use of geothermal heat pumps to heat and cool buildings. Only a small fraction of the geothermal resources are in use today. Much more could be brought on line in the short term with appropriate incentives.

What is Geothermal Energy

Geothermal energy is renewable heat enery from deep in the earth. Heat is brought to the near-surface by thermal conduction and by instrusion into the earth's crust of molten magma originating from great depth. Ground water gets heated to form—hydrothermal resources—naturally occuring hot water and steam. Use of hydrothermal energy is economic at a number of high-grade sites. Hydrothermal resources are tapped by existing well drilling and energy conversion technology to generate electricity or to produce hot water for direct use. Earth energy is used by geothermal heat pumps. Hot dry rock, magma and geopressured geothermal energy have enormous potential, but cannot be economically developed without the benefit of further R&D.

For generation of electricity, hot water, at temperatures ranging from about 300 F to more than 700°F, is brought from the underground reservoir to the surface through production wells, and is flashed to steam is special vessels by release of pressure. The steam is separated from the liquid and fed to a turbine engine, which turns a generator. Spent geothermal fluid is injected back into peripherial parts of the reservoir to help maintain reservoir pressure.

If the reservoir is to be used for direct, heat application, the geothermal water is usally fed to a heat exchanger before being injected back into the earth. Heated domestic water from the output side of the heat exchanger is used for home heating, vegetable drying and a wide variety of other uses.

Increases Energy Supply

Geothermal energy is here today—it is not merely a hope for the future. Approximately 5,700 MWe are currently being generated in some 20 countries from geothermal energy, and there are 11,300 MWt of installed capacity worldwide for direct-heat applications at inlet temperatures above 95 F. Since a typical nuclear power plant produces about 1,000 MWe, worldwide electrical production from geothermal energy is equivalent to that from 6 nuclear plants. (However, typical Indian nuclear plants have a capacity of 200 MWe, and hence the worldwide electricity generation from geothermal energy is equivalent to the production from 30 plants.—Editor)

As a result of today's geothermal production, consumption of exhaustible fossil fuels is offset, along with the release of acid-rain and greenhouse gases that are caused by fossil-fuel use. Today's geothermal energy use in the United State alone is equivalent to the burning of 60 million barrels (bbl) of oil each year, while worldwide geothermal energy use is equivalent to the burning of 150 million bbl of oil per year. For comparison, the entire U.S. Strategic Petroleum Reserve contains about 600 million bbl of oil.

Hydrothermal Reserves

Geothermal energy is found in many places on the earth. It is an important source of energy in several third-world countries including the Philippines, Indonesia, Mexico, countries of Central and South America, and countries of eastern Africa. Among the developed countries using geothermal energy are Italy, Iceland, New Zealand, Japan and France, along with the United States. There is a very large geothermal resource base in the world, much of which can not yet be economically used. In fact, the resource base for the renewable energies-geothermal, biomass, solar, and wind-is much larger than the total resource base in coal, oil, gas, and uranium.

Flexibility and Reliability

Systems for use of geothermal energy have proven to be extremely reliable and flexible. Hydrothermal electric power plants are on line an average of 97 of the time, whereas nuclear plants average only 65 and coal plants only 75 on line time. Geothermal plants are modular, and can be installed in increments as needed. Both baseline and peaking power can be generated. Construction time can be as litle as 6 months for plants in the range 0.5 to 10 MWe and as little as 2 years for clusters of plants totalling 250 MWe or more.

Decreases Demand

No active technology for home heating and air conditioning is more efficient than the geothermal heat pump (GHP). GHPs are significantly more efficient than air-source heat pumps, central air conditioners and gas furnaces. GHPs use normal-tempreture earth of groundwater for heating during the winter, cooling during the summer and supplying water year around. The heat pumps itself operates on the same principal as the home refrigerator, which actually is a one-way heat pump. The GHP, however, can move heat in either direction. In the winter, heat is removed from the earth and delivered into the home of building (heating mode). In the summer, heat is removed from the home or building and delivered into the earth for storage (air-conditioning mode). On either cycle, culinary water is heated and stored, supplying all or part of the function of a separate hot water heater. Because electricity is used only to transfer heat, not to produce it, the GHP will deliver 3 to 4 times more energy than it consumes. It can be effectively used over a wide range of earth temperatures.

The GHP unit sits inside the home or building, at the site of a normal gas furnace. In a typical installation, a loop of plastic pipe is placed in a nearby vertical drill hole from one hundred to several hundred feet deep and the hole is backfilled with clay. A water/antifreeze solution is circulated through the loop and through the heat pump for removing heat from or transferring heat to the ground. There is no consumptive use of groundwater whatsoever, nor is there any contact between the solution in the plastic pipe and the earth or groundwater. Installation easily conforms to local construction and well-drilling regulations. Topical loop installations are warranteed for 50 years. In a 1988 survey of GHP buyers, 97% said that they were happy with their purchase and would buy again.

More than 100,000 electrically-powered GHPs have been installed in homes and buildings in the U.S. upto July, 1990. Additional installations are being actively promoted by investor- owned utilities and rural electrical cooperatives as a means of promoting energy efficiency and better managing demand. GHPs can cut 1 to 5 kilowatts (KW) of peak generating capacity requirement per residential installation.

Positive Environmental Impact

The competing goals of increased energy production for worldwide social development and of mitigating release of atmosphere-polluting gases are not com pi table using today's fuel mix, which relies heavily on coal and petroleum. In the United States, electric utilities now account for 70% of sulphur dioxide emissions (the main cause of acid precipitation). 33% of our nitrogen-oxide emissions (that induce formation of ground- level ozone), and 20% of the release of gases linked to the atmospheric greenhouse effect, and 50% of all nuclear waste.

Development of geothermal energy has a large net positive impact on the environment compared with development of conventional energy sources. Geothermal power plants have sulphur-emission rates that average only a few percent of those from fossil-fuel alternatives. Nitrogen oxide emissions are also much lower in geothermal power plants than in fossil power plants. Nitrogen-oxides combine with hydrocarbon vapors in the atmosphere to produce ground-level ozone, a gas that causes adverse health effects and crop loses as well as smog.

There are other environmental advantages to geothermal energy. Geothermal power plants require very little land, taking up only a fraction of that needed by other energy sources. Other land use can mingle with geothermal plants with little interference or fear of accidents.

Truly The Low Cost Alternative.

The real cost of energy is not all reflected in what we pay at the petrol pumps or in our electricity bills. Much of the true costs of energy, using today's fuel mix, are hidden. If the cost of corrosion damage, health impacts, crop losses, radioactive waste disposal, military expenditures to protact foreign energy sources, and direct economic subsidies to the fossil-fuel and nuclear industries were totalled and added to the energy bills we see, the price would astound us.

The answer to decreasing the true cost of energy is not to hide part of the cost but to alter our energy-use patterns and fuel sources to bring in much more renewable energy and conservation. If we changed our methods of utility regulation to require integrated-resource planning with all environmental and other hidden energy costs explicitly accounted for, it would be possible for utilities (electricity boards in Indian nomenclature—editor) to use more renewable-energy resources economically. Our total energy cost would decrease and we would have a much cleaner environment.

Accelerated development of renewable resources and conservation are the lowest-cost options in some cases, even with the hidden subsidies for the conventional energies.

If hidden subsidies were made visible in energy pricing, geothermal energy would be seen for what it really is—the energy bargain of the century.

For more information, contact the Geothermal Resources Council of the University of Utah Research Institute.

SUN DAY 1992 Bulletin

Nuclear Skeletons Begin to Bark

Reactor operation like the operation of any other complicated piece of machinary is both fairly simple and hellishly complex. In normal situations—which is most of the time, routine tasks have to be performed. These are straighforward and any technical person can be instructed to do them. It is only when the situation becomes for some unknown reason abnormal, that the importance of rigourous training becomes apparent. The 155 operators associated with the Dhruva and Cirus nuclear power reactors at the Bhabha Atomic Research Centre (BARC) at Trombay, who went on strike for more than a fortnight have once again brought into highlight the extraordinary dangers posed by the BARC establishment to the city of Bombay. The following article also demonstrates the total disregard of safety norms displayed by the nuclear authorities.

n the words of the reactor operators, the attempt to rescan Dhruva with a makeshift crew of engineers and inexperienced technicians which was tried by the BARC establishment in an effort to break the strike was akin to "the nuclear power establishment playing with an atom bomb."

Standing instructions stipulate the presence of a minimum of ten qualified operatoes at any given time, whether the reactor is operating or not. In an attempt (ultimately successful) to break the strike, the BARC establishment, used a makeshift crew of two engineers, one trainee engineer and technical personnel from other parts of BARC.

According to the striking operators, the engineers were managing the control panels while the rest of the technical staff were deployed at various places in the plant to merely act as watchmen. "While they can read temprature and pressure gauges, they are not in a position to interpret them. They do not know how to stop or start operations, they have no practical experience. There are so many areas of this large plant that nobody is watching. The working conditions of a reactor are completely different and cannot be compared to other BARC operations," the operators said.

Elaborating on a worst-case scenario, association members pointed to the possibility of a power failure and the immediate need to keep the cooling system functioning. While there is a system of automatic restart, there is chance that certain isolated valves remain closed, affecting vital linkages. Maloperation by an unfamiliar operator could compound the situation. Failure to act within seconds to keep emergency lines working, could result in the reactor going out of control.

The fight to get official recognition of the BARC High Flux Reactor Operators' Association is held to be a means of collectively drawing attention to the violation of safety standards to which reactor operators are routinly subject. The association says individual grievances, recorded since 1972, have been consistently ignored and complainants have been victimised.

The demand for recognition of their association and access to independent redressal under the Industrial Disputes Act is hence an immediate objective, it was explained. Under the present system even the officially-recognised unions have no representation on the Atomic Energy Regulatory Board.

This is perhaps for the first time in recent years that staff associated with reactor operations have revealed details of their functioning, though on conditions of anonymity.

The association has highlighted specific instances showing how safety and health of reactor operators is being jeopardised. The AERB has confirmed these incidents, but maintained that radiation exposure is within "permissible limits."

On October 31, 1989, when the reactor was shut down, N.S.Maikar, an operator, was instructed by the Reactor Superintendent, R. Chowdhury, to enter the 'Loop Room', a shielded area with a strong radioactive field, to 'exercise (open and shut) the valves'. The reactor cannot start up unless this room is first locked with a master key. When the reactor is shut down, entry of personnel and the time they spend in the room is determined by Reactor Health Committee. The usual practice followed by RHC is to permit five minutes per person, exposing him to a 'permissible' radiation dose of 50 millirem at a time.

By accident Malkar's presence in the shielded room was overlooked, and the steel door, with concrete shielding of one foot thickness, was locked. The job had taken around ten minutes as operation of the valves preoved to be difficult. Meanwhile the reactor was turned on with power generation of ten MW. Failing to draw attention by banging on the door, Malkar finally managed to attract the control room's attention when he tripped the reactor by switching off the main coolant pump.

Although he was locked in the room for 20-25 minutes, RHC told Malkar that he had only received a dose of 10 millirem. It was also claimed that his detector, which indicates individual radiation dosage, was found faulty. Malkar has alleged irresponsibility and violation of safety norms by the authorities, holding that he was subject to a higher dose of radiation, and was not sent for a medical check up because the matter was sought to be suppressed. In February, he was made to fail a promotion test, as punishment for exposing this incident, the association alleged. Since this incident, a telephone has been installed in the shielded room, but it seldom works, operators said. According to AERB, Malkar was exposed to 260 millirem.

Other reactor operators, with over ten years service in Dhruva and Cirus, testified that in all these years, they hevebeen subject to only one cursory medical check up. They expressed apprehension of exposure to higher radiation usage than what is officially made out. Operators are routinely subject to high radiation risks as they are forced to enter the shielded room when the reactor is running on low power, less than 1 MW. in order to check the Failed Fuel Detection System. Failure of the cladding on the aluminium rods results in contamination of the coolant on contact with the uranium.

Although this failure is detected on a graph in the control room, its excat location has to be checked by physical intervention. Such incidents are reported on practically every alternate shift. Organising resistance to this risk negligence of which violates international safety norms, led to the suspension of Chacko Jacob, the general secretary of the association.

Radioactive water was found leaking from a corroded pipeline between Cirus and Effluent Treatment Plant. The leakage was however discovered only after another pipe carrying sea water got ruptured, and contract labourers were brought in to dig the area. Reactor operators reported high radiation contamination of their clothes detected by monitors, thus drawing attention of RHC to the source. They found the radiation background to be 10 millirem per hour, it was reported. The association said it was not aware of measures to decontaminate the contract labourers, or efforts to trace where the excavated soil in that area has been dumped. AERB confirmed that the incident occured in December 1991, and said that "the exposure of contract workers was well within the stipulated limits."

Association members said they were concerned about the plight of maintainance workers, who are not educated about the dangers they face, and are operating without close supervision of the RHC. They cited instance of such workers operating in high radioactivity areas.

Recently, a heavy water spillage flooded the basement and reactor hall, and maintanance staff had to physically mop the area, it was alleged. Confirming this incident, AERB said in April-May 1991 that there was "a minor heavy water spillage. The maximum radiation exposure received by personnel during this work was less than 2 per cent of the limit stipulated by AERB."

Rupa Chinai
The Sunday Observer 21.6.1992

Subscription Rates:

Rs. 25/- per year South Asia
U.S.$ 15/- per year or equivalent in other convertible currencies (airmail overseas)
(Rs.300/- per year if paid for in India)
Rs.250/- for life (only within India)
Please add Rs.6/- for cheques
Drafts should be drawn on State Bank of India, Valod (0531)

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Subscriptions, donations, manuscripts, inquiries regarding circulation, etc. should all be addressed to:

Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist:Surat, 394641 INDIA

Please do not send cheques or drafts addressed to Surendra Gadekar
Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printry. Ahemedabad

PRINTED MATTER BOOKPOST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Vol.6 No.l August/September 1992

An Appeal to Conscience

Recently there has been a spate of reports in our media regarding the starting of the Kakrapar Atomic Power Plant. We have cause to suspect that the plant is being started without the authorities taking the minimum precautionary steps needed to ensure the safety of the people living in its neighbourhood. The note written by Shri K. Natarajan, the head of instrumentation and control at Kakrapar power plant which was published in the *Sunday Observer* of 26.7. '92 by Ms Rupa Chinai *in* her article on safety violations at the Kakrapar plant, proves that the authorities in their hurry to start the plant have disregarded their own safety norms. These violations of safety procedures are a dangerous game with the lives of the people in the vicinity at stake. We pray to God it doesn't, but in case there is an accident at the plant, and the untested safety systems fail to perform their function, the consequences would be disusterous. Keeping the public in the dark regarding it's own safety is a step toward unbridled dictatorship. The fact that these dangerous actions are being undertaken due to considerations of personal gain make them akin to treason.

As a concerned citizen living near the Kakrapar plant, this total disregard for the safety and well-being of the nearby public, is intolerable to me. Therefore, I have decided to undertake a five day fast commencing from the 11th of September, 1992. The purpose of the fast is threefold. It is firstly, to express my concern, secondly to demand an enquiry to establish the facts and thirdly to request the authorities to refrain from opening the plant till it satisfies all the safety norms established by the nuclear authorities themselves, This fast is not being undertaken against any particular person but rather in a spirit of humility as a prayer to God to grant wisdom to all and also as a citizen's protest against this blind system which is hurtling us all towards extinction.

I have for long been an opponent of the policy of nuclearisation of the country and I feel that the entire nuclear programme ought to be stopped. forthwith. However, that aim would be achieved only when the power of the entire population rises against this suicidal system. The purpose of my mat is more limited. It is a cry against the total abdication of responsible behaviour by public servants.

Unit 1 of the Kakrapar Atomic Power Plant went critical on the 3rd of September, 1992. In the old days, Prime Ministers used to cesne tor these ceremonies and 'dedicate the plant to the nation", but nowadays, Prime Ministers are too busy protecting their throne to have much time for these mundane events. So, the task is performed by the Chairman, Department of Atomic Energy. This worthy is however, considered too small a fry to dedicate anything to anything. Hence he merely declared the plant critical. Also, critical were hundreds of workers in the audience, who wore black armbands as a protest against the fact that their demands had not been granted. Six tonnes of sweets (Pedha) had been specially ordered from Baroda for the occasion. Being a persona-non-grata with the plant authorities, I had not been invited for the grand occasion. Otherwise, I would have certainly advised the local people to have their fill of the pedhas, since this would be the last occasion for the next many millenna that they could enjoy a milk product without worrying about the threat of radioactive contamination.

Narayan Desai

Response to the fast

The response to the fast has been overwhelming. People from all over India have responded in their own fashion. Some have fasted for the whole five days while others have gone on a one day sympathetic fast at Udaipur, Ahmedabad, Surat, Vedchhi, Valod, Bedkuvadur, Ghasiamedha and Mangrol. In Vedchhi itself, 250 people fasted for one day. Daily discussions were held at The Sampoorna Kranti **Vedchhi. Street plays were performed daily in different villages. The villagers in the vicinity of the Kakrapar atomic power plant have decided to organise people's vigilance committees. Involvement of the youth has been overwhelming. They "are concieving ways to educate the public on this issue. A large procession followed by a meeting was held at Valod on the 15th where a resolution was passed to demand foran independent inquiry.**

Anumukti is late. You *now* ***read the*** *announcement of the fast* ***and*** *the opening of RAPP, followed by the report and reponse to the fast.*

NOTICE BOARD

JP Memorial Lectures

Date: October 8th. and 9th.

Venue: Sumpoorna Kranti Vidyalaya, Vedchhi, Dist. Surat 394641

Speaker: A. Mohan Kumar, a well known environmentalist from Kerala who had taken part in the Silent Valley movement and was co-ordinator for Save the Western Ghats March in Kerala.

Subject: Development-'Kerala model" • Myth and Reality.

The lectures will be accompanied by a slide show and will be conducted in Hindi.

All are invited.

Workshop on "Environmental Health Surveys'[1]

A workshop will be conducted at Sampoorna Kranti Vidyalaya, Vedchhi on various aspects associated with epidemeological survey in the vicinity of a Nuclear Power Plant. The Rawatbhata health report will be discussed in detail. Problems, requirements and resources available for conducting epidemeological surveys also would be discussed.

Date: 26th to 28th of December 1992

All interested people should write to Sanghamitra before the end of October 1992.

All Gujarat Cycle Yatra

Anumukti and Gujarat Sarvodaya Mandal are organising a cycle yatra covering ten districts of Gujarat It's purpose is to focus attention on aspects of sustainable development and peoples rights. Special focus will be on the problems of big dams, nuclear power plants, multinational corporations, and suppression of forest rights.

The one month Yatra is scheduled for March end. We need your suggestions and support in organising the details. Contact Anumukti

Editorial

The opening of Kakrapar on September 3, 1992 by the Chairman of Atomic Energy Commission with a fanfare should have been the saddest day in our whole lives. And it was to some, extent. But it was also a beginning of the end for the nuclear industry. *The* hurry in which Unit 1 of KAPP was forced into criticality without even adhering to their own safety norms shows the desperate plight of The Nuclear Power Corporation to attract public funding. An 85% cut in its budgetary requirements by the Centre, and the with the Nuclear Power Corporation's longer than the usual time to finish any project before KAPP, has precipitated severe cost overruns. Flouting basic safety norms at KAPP was an index of a desperate effort for survival.

The financial situation has become so grave that the Chief of the Atomic Energy Establishment, Dr. P.K. Iyengar has been quoted in Nucleonics Week • April 1992 (a nuclear industry journal) asking for foreign funding as well. He says, "In view of DAE's longer term funding needs, India would also consider strengthening its nuclear programme through future capital injections from outside institutions such as the World Bank, other international development agencies and banks. India would have no reservations about using foreign capital to finance nuclear projects built with the assistance of Western Industry."

This is a tacit admission that the Indian nuclear industry's boast of being indigenous and self-sufficient is truly hollow.

With the recent BARC revelations by the media, it is trapped in its own fundamental contradictions. We should soon be fed with a diet of systematic disinformation. We need to be vigilent.

BARC Spews Radioactive Poison

* Disaster of significant magnitude
* Effluents may have leaked into Arabian Sea
* Likely contamination of fish

A major radioactive leakage from ill-mantained pipelines in the vicinity of the CIRUS and Dhruva reactor complex at the Bhabha Atomic Research Centre, 15 km. from the heart of Bombay, is found to have caused severe soil contamination. Evidence also points to the possibility of the leakage having taken place for a number of years, thereby causing an outflow of contamination towards the sea.

According to independent experts, the incident is a disaster of significant magnitude.

The presence of cesium-137 (Cs-137) in the analysis of soil and water around the leakage site means that a most dangerous radioactive isotope is being released in an open area outside the reactor complex, a situation unacceptable under any internationally accepted norm.

The high readings of Cs-137 in the soil area between the reactor and the sea also points to its uncontrolled outflow towards the sea, where it is likely to have been absorbed by marine life. Cs- 137 entering the food chain can have severe repercussions on human beings as it is absorbed by the cells of the body. It remains radioactive for hundreds of years.

The leakage was first detected by reactor workers on December 13,1991, when a fountain of water shot out onto the lawn between the reactor and the sea. The plant management surmised that the sea- water pipeline must have, burst, even though the entire area is criss-crossed with many other lines, carrying radioactive and chemical effluents. The establishment set six contract labourers on the task of digging a pit, to reach the burst pipeline, eight feet below the surface. These workers wore no protective gear or radiation monitoring badges.

The presence of radioactivity in the area may never have come to light had it not been for an alert official in the office of the Radiation Health Inspectorate at the complex, who got wind of the incident and sent for a water sample from the puddle in the excavated pit. The activity recorded in the water sample was 40 becquerel/ml. (becquerel is a unit of radioactivity).

The contract labourers who had worked for almost eight hours inside the pit on December 13 and 14, 1991, were thereafter hastily pulled out, given a bath, new sets of clothing and packed off home. There is no evidence of the labourers having been subject to radiation monitoring tests.

However, the authorities sought to deduce the dosage the labourers had received. On December 19, department personnel dug a small portion from the bottom of the excavated pit. During a 12- minute period, the whole body dose recorded by the DRD (a radiation monitoring badge) ranged from 10 to 30 millirems (mR). Extrapolating on this observation, the radiation exposure of the contract labourers is held to be in the range of 300 to 1,000 mR. (A normal chest X-ray gives a dose of 70 to 150 mR. This would amount to the labourer receiving 12 X-rays during the course of work.)

Tests done in the excavated pit showed a radiation dosage ranging from 200 to 700 mR/hour, while in one specific spot, described as the "Hot Spot area below the chamber" (inspection chamber along the pipeline), it zoomed to 2,000 mR/hour.

Recording of the "soil specific activity level" revealed the presence of Cs-137. In 50 percent of the samples, Cs-137 activity was 1-10 k Bq/gm, and in another 50 percent of samples it was 10- 60 k Bq/gm. Samples of vegetation in the area also revealed contamination, and birds and insects in this area are its carriers into a wider area.

Meanwhile, 325 drums of contaminated soil has already been sent to the Waste Management Deportment. The department has said that the solid active storage would get exhausted if the entire quantity of contaminoted soil is to be excavated, and has stopped further consignments.

On the magnitude of radioactivity present in the soil area at CIRUS, independent, authoritative sources said they were "chilled" by these figures. They compared these to the "acceptable limits" set by the nuclear establishment itself. An advertisement of the Nuclear Power Corporation in The Times of India (July 8, 1990) gives figures of natural background radiation as around 100 mR per year, and compares it to "acceptable" radiation within a 1.6 km. radius of a nuclear plant: 1 to 2 mR per year. The outer limit for dosage to occupational worker is 5,000 mR per year, and for the members of the public it is 100 mR per year.

Taking the lower figure of activity found in the CIRUS pit, 300 mR/hr, it means that persons spending a year in this area are subject to 2.6 million mR during that span, the experts said

According to publications authored by BARC scientists, the "acceptable limit" for Cs-137 is 0.13 Bq/ml. in sea water. In the UK, the permissible limit of Cs-137 in soil is 900 Bq/kg (or 0 9 Bq/gm). Taking the average activity figures found in the CIRUS drums, around 27 k Bq/gm, it means that the activity is 30,000 times higher than permissible limits in the UK, the experts added.

Circumstantial evidence at CIRUS points to discharge of Cs-137 into the Arabian Sea, where despite the impact of dilution, the chances of it being imbibed by marine life are real.

What was the source of such widespread contamination? The radioactive wastes came from the Rod Cutting Building, where all uranium and plutonium fuel used in the reactor is stored for years in large pools of water, to allow decay and cooling of radioactivity before further treatment. To maintain purity, the storage pool is periodically washed with acid, and the effluents are dangerously radioactive. This discharge is piped to the waste treatment facility in a planned manner, and should never be allowed into the sea, atmosphere or land.

Yet, unbelievably, the pipeline carrying this deadly waste, also at other times, acted as a storm water outlet. The system envisaged that by closing valves, the active discharge would be diverted to waste management, but in reality, for whatever reason, the untreated wastes flowed towards the sea.

The damage to the Concrete Inspection Chamber along the pipeline, where the highest activity is found, as also the sea water outfall pipe (made of half-inch thick steel and lined by two-inch thick RCC) which crosses the ceramic pipe, is evidence of the slow, corrosive force at work.

Worse still, the plant management was aware of leakage occurring in this same pipe, at the same spot, in 1978, but did nothing. At that time, during the construction of the Dhruva septic tank, several hundred metres away towards the sea, Cs-137 was found in the soil. The sample analysis read 20 Bq/ml. The source of leakage was traced to this same pipeline and inspection chamber. Apart from isolating the pipeline and inspection chamber for a while, no attempt was made to replace the decaying pipeline. The report was filled and forgotten, sources alleged.

On January 13, 1992, the BARC and Radiological Safety Committee clearly stipulated three conditions before CIRUS received permission from the Safety Review Committee for Operating Plants (SARCOP) to resume operations. These conditions included ensuring repair and integrity of all liquid effluent lines and assessment and plans for disposal of the contamination. Defying this, and without fulfilling these conditions, the plant management resumed operation on February 6, 1992. SARCOP confirms that its permission was given only on April 1,1992.

When contacted, SARCOP ignored written questions submitted by this correspondent and rejected the request for an interview. It however gave a written response outlining the remedial measures taken in removing the contamination and investigating the incident. It stated that there was no reported leakage on this line previously. It said the contaminated soil has been properly immobilised.

RUPACH1NAI
SUNDAY OBSERVER,
Sept.6,1992:

Radioactive Fountain in the Gamma Garden!

This extrapolated 'casual' labourers' dose is a fine example of the nucleocratic callousness. Any leak involving liquids in a place criss-crossed by various pipes carrying radioactive effluents has to be treated with due care. Safety culture would mean that one presumes the worst and goes into the area well protected. Instead, what we have is that the all knowing big shots decide through visual inspection that the leak is that of plain sea-water only and rush in contract labourers with no protective gear or warning to these hapless fellow-humans. And when through luck these big shots do get a warning, their first priority is not towards the health of their fellow-beings who are quickly packed off with a shower and some new clothes but no continued health monitoring. They are more concerned about saving their own necks by showing that the disaster is no disaster at all. Notice the procedure of estimating the dose received by the casual workers. Five days after the event, departmental workers are sent in with full protective gear and measuring devices. Naturally, they go to the least radioactive part of these mess, stay there a few minutes and then come back. The variation in radiation they received in this short time is taken to be the upper and lower bound for the radiation received by the casual workers who, it is assumed worked for six hours while, actually records show that they did work for more than eight hours, This is the only way we get to the figure of a maximum dose of 1,000 mR. (12 minutes gives a dose of 10 to 30 mR, therefore 1 hour gives a dose of 50 to 150 mR and 6 hours work would give a dose from 300 mR to 900 mR.) The extra 100 mR is a small mercy from nucleocrats. But read the next line. "Tests done in the excavation pit showed radiation dose ranging from 200 to 700 mR/hour. " Now the excavation of this very pit was done by the casual workers. Thus, chances are that these fellows received anywhere from 1,600 to 5,600 mR of radiation while earning their 'new' set of clothes. And this assumes that none of the workers went anywhere very close to the 'hot-spot' in which case his dose would'zoom' towards doom.

Casual workers are members of the 'general' public. The most likely dose received by the unfortunate workers is way beyond internationally accepted radiation safety standards to which our nucleocrats pay ritual obeisance. And hence we find a funny interpretation of the status of the casual workers. According to Mr. Soman, the Chairman of the Atomic Energy Regulatory Board, and supposedly the public's protector in all matters radioactive, "Casual workers cannot be differentiated from the regular workers in the amount of radiation they received." They can and are ofcourse differentiated in the amount of pay, working conditions, facilities, security of tenure, monitoring, etc. *Editor*

EAST AND WEST ON NUCLEAR POWER

Leaders of two nations - one being the epitome of material well-being while the other literally represents a nation in exile • have commented on nuclear power. One would expect the people of Tibet who are struggling to regain their rights to clamour for nuclear power, while the U.S. having become materially well-off would now strive for spiritual development. This is what their Leaders have to say:

GEORGE BUSH

On June 18, 1992, President George Bush held a brief press conference outside an oil recycling firm in California. The press conference focussed on energy and environmental issues. At one point, the President was asked, ..if reelected, what incentives would you devise to aid our country in reducing our overconsumption of energy resources?

President Bush's answer, in full:

"We've got an energy bill before the Congress right now that does that. Encourages alternative use of fuels. We have sound environmental practice on off shore. We 've got in this bill—I mean, from lightning..light..kinds of lightbulbs that really save enormous amount of energy, to alternative uses of fuel, we've got a good program. It's hung up in the US Congress right now. But I would press forward on that energy bill and try to move forward.

Let me say this as a word of caution, though. We are more and more dependent on foreign oil. And it was about a year and half ago, when the Persian Gulf situation got fired up, that it was predicted oil would go to $80 a barrel overseas. And I don't know if you saw what Saddam Hussein said the other day. He said the biggest mistake he made is, when he first moved into Kuwait, that he didn't move into Saudi Arabia. And you want to project something that would just shoot these gasoline prices right off the scoreboard, try that one on

"So what we've got to do, it seems to me, is to try to become less dependent on foreign oil, for security reasons, and that means alternate sources. I may get into a big fight here, but I believe that safe nuclear power can be used safely. It's clean burning, I believe, clean, and I believe that we ought to facilitate that rather than turn our back on that. But it does concern me that we're becoming more dependent on foreign oil, and yet I think the answer is conservation and alternative sources. And that's in our energy bill.".

(We just thought you'd like to know. Perhaps President Bush might benefit from learning that nuclear power cannot possibly contribute to reducing U.S. oil dependency when foreign oil accounts for only about 1% of *VS.* electricity, and even that oil is residue from other uses. On. the other hand, the President might benefit from a few sessions with an English teacher as well... From Nuclear Monitor)

THE DALAI LAMA

In this century, civilization has rapidly advanced. However, along with material development and undue emphasis has been made on external progress. Without even knowing it, we often neglect to foster the most basic human need for kindness, love, co-operation and caring. Yet, the very development of human society takes place on the basis of this foundation. If we lose our foundation, our essential humanity, what point is there in pursuing material improvement alone?

Everyone desires happiness and no one wants suffering. All of us also have equal rights to avoid suffering and pursue happiness. Therefore, in pursuing any human activity it is of the utmost importance to bear this in mind. The question to ask is: is this activity beneficial to us? Here, it is important to think not only of the temporary benefits but also of the long term consequences. Similarly, in the case of exploitation of uranium we must ask the same question.

In their eagerness to create nuclear weapons and then to exploit the potential resources of nuclear energy, scientists and politicians have underestimated or overlooked the long-term harmful effects both to mankind and to the environment. What is required to counter this is the development of a proper sense of responsibility based on compassion for our fellow human beings.

With regard to the effects of uranium, we are not only concerned with the rights of the many defenseless people living in various parts of the world but also of future generations. I feel strongly that the cause of peace in the world is inseparable from our ability and willingness to protect the rights of others.

From Message sent to the World Uranium Hearing held at Salzburg, Austria on September 13 -18,1992.

AN APPEAL FROM ANUMUKTI

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Bomb Tests and Earthquakes

"Nuclear bomb testing **has** doubled the **earthquake rate."**
Garry Whiteford, Professor of Geography, University of New Brunswick

"Abnormal meteorological phenomena, earthquakes and fluctuations of the earth's axis are related in a direct cause and effect to testing of nuclear devices."
Shigeyoshi Matsumae, President Tokai University Yoshio Kato,
Department of Aerospace Science.

On June 19, 1992, the United States conducted an underground nuclear bomb test in Nevada. Another test **was** conducted only four days afterwards. Three days later, a series of strong earthquakes one as high as 7.6 on the Richter scale rocked the Mojave desert 176 miles to the south. They were the biggest earthquakes to hit California this century. Only 22 hours later, an "unrelated" earthquake of 5.6 struck less than 20 miles from the Nevada test site itself. It **was** the biggest earthquake ever recorded near the test site and caused one million dollars of damage to buildings in an area designated for permanent disposal of highly radioactive nuclear wastes only fifteen miles from the epicenter of the earthquake. Although the quake provoked renewed calls for a halt to plans for storing radioactive materials in such an unstable area, the larger questions have still not been raised in the United States: Do bomb tests actually cause earthquakes? Do nuclear tests make the planet more prone to geologic disruption?

Understandable Unease

The latest (and apparently continuing) earthquakes in California and Nevada suggest an inquiry by US scientists may be long overdue, and could lead to an examination of studies over the past twenty years from scientists in Britain, Germany, Japan and Canada, warning that nuclear tests **are** weakening the earth's crust, triggering earthquakes and causing the earth's pole to shift.

In a statement on July 14,1992, responding to "understandable unease", the Department of Energy in Washington **asserted** the relationship between nuclear testing and earthquakes is "nonexistent". Yet common sense would suggest the cumulative effect of so may nuclear tests around the world would leave the planet at least somewhat shaken. Indeed in 1956, Estes Kefauver, then Democratic Vice-Presidential candidate, warned, "H.bomb tests could knock the earth 16 degrees off its axis!" He was simply ignored.

However, in a study 20 years later by two Japanese scientists, entitled Recent Phenomena on Earth and Atomic Power Tests, Shigeysoshi Matsumae, President of Tokai University, and Yoshio Kato, Head of the University's Department of Aerospace Science concluded: Abnormal meteorological phenomena, earthquakes and fluctuations of the earth's axis are related in a direct cause-and-effect to testing of nuclear devices...Nuclear testing is the cause of abnormal polar motion of the earth. By applying the dates of nuclear tests with a force of more than 150 kilotons, we found it obvious that the position of the pole slid radically at the time of the nuclear explosion... Some of the sudden changes measured up to one meter in distance.

Not quite Kefauver's 16 degrees off the axis; but not entirely reassuring either. Two years later, on 12 October 1978, the British science journal *New Scientist* reported: Geophysicists in Germany and England believe the 1978 earthquake in Tabas, Iran, in which at least 25,000 people were killed, may have been triggered by an underground nuclear explosion.. British seismologists believe the Tabas earthquake implies a nuclear test that has gone awry. Moreover, a seismic laboratory in Uppsala, Sweden, recorded a Soviet nuclear test of unusual size ten megatons at Semipalitinsk, only thirty-six hours before. One German scientist specifically implicated this test in the origin of Tabas disaster.

More recently, in April, 1989, at the Second Annual Conference on the United Nations and World Peace in Seattle, Washington, Gary T. Whiteford, Professor of Geography at the University of New Brunswick in Canada, presented the most exhaustive study yet of the correlation between nuclear testing and earthquakes. In a paper entitled Earthquakes and Nuclear Testing: Dangerous Patterns and Trends, Whiteford presented alarming conclusions which to this day have remained almost completely ignored in the US, although the paper has been widely translated and published abroad.

Whiteford studied all earthquakes this century of more than 5.8 on the Richter scale. "Below that intensity," he explained, "some earthquakes would have passed unrecorded in the earlier part of the century when measuring devices were less sensitive and less ubiquitous. But for bigger quakes the records are detailed and complete for the entire planet." So Whiteford was able to make a simple comparison of the earthquake rate in the first half of the century, before nuclear testing, and the rate for 1950 to 1988. In the 50 years before testing, large earthquakes of more than 5.8 occurred at an average rate of 68 per year. With the advent of testing the rate rote "suddenly and dramatically" to an average of 127 a year. The

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earthquake rate has almost doubled. To this day the US military attributes the increase to "coincidence". As Whiteford says, "The geographical patterns in the data, with a clustering of earthquakes in specific regions matched to specific test dates and sites do not support the easy and comforting explanation of 'pure coincidence'. It is a dangerous coincidence."

Within the data he found other suggestive patterns. The one-two nuclear test punch that preceded by only a few days the July earthquakes in California this year may reveal a special danger. The largest earthquake this century took place in Tagshan in North-East China on July 27,1976. It measured 8.2 and killed 800,000 people. Only five days earlier the French had tested a bomb in the Mururoa atoll in the Pacific Four days later the United States tested a bomb in Nevada. Twenty-four hours later the earthquake hit China.

Killer Quakes & Bomb Tests

In an even more revealing analysis, Whiteford studies so-called "killer earthquakes" in which more than one thousand people have died. He compiled a list of all such 'quakes since 1953 and matched them with nuclear test schedules. Some dates were not available, but in those that were, a pattern was evident: 62.5% of the killer earthquakes occurred only a few days after a nuclear test Many struck only one day after a detonation. More than a million people have now died in earthquakes that seem to be related to nuclear tests. Again, the governments of nuclear nations claim the results are mere coincidence. Officially the US energy department maintains that even their most powerful nuclear tests have no impact beyond a radius of 15 miles. The claim is challenged by the instruments of modern seismology that can register nuclear tests anywhere in the world by measuring local geological disruptions. Whiteford speculated that although the reverberations may fade within 15 miles of test, they are merely the first ripple of a wave that travels through the planet's crust and spreads around the globe.

In 1991, the Nuclear Age Peace Foundation published Whiteford's findings in an article called Is Nuclear Testing Triggering Earthquakes & Volcanic Activity? In an interview with California State seismologist, Dr. Lalliana Mualchin, the foundation went on to inquire into the long-term effects of testing. Mualchin was asked if the cumulative effect of nuclear testing might trigger earthquakes and volcanoes. He replied, "A single nuclear test may have little *effect* on the earth, like that of an insect biting an elephant. But the cumulative effect might move the earth's tectonic plates in a manner similar to how a swarm of insects might start an elephant running. If an insect bites an elephant in a sensitive spot, such as an eye or ear, then there might be a vast movement out of all proportion to the size of the bite." The article concluded, "Who will the world hold responsible if suddenly an unprecedented series of violent earthquakes and volcanoes shake the earth? Will nuclear testers be able to assure the world they were not responsible?

Ten More Years of Tests?

Recent decisions announced by the Bush administration to "limit". tests in size and number for ten years are meaningless. They represent little or no change from what in fact has been the practice for the last several years. They avoid dealing with the mounting call by Congress and the world-through the UN.- for a halt by all nations to all testing forever. According to UPI, President Bush will actually veto any effort to halt testing. Bush says he wants testing to continue "for at least ten years" to check the safety and reliability of nuclear bombs. The Russians and the French no longer feel the need to conduct such "checks*, and have halted testing altogether. Why cannot the USA?

However, as the next presidential election nears, there is an emerging prospect of finally ending 50 years of bomb tests. Governor Bill Clinton's office says he supports a comprehensive nuclear test ban. His running-mate Al Gore is one of the supporters of the Congressional call for a one-year moratorium on testing.

From.The War and Peace Digest

Action:

Protest Export Of Irradiated US Fruits

Irradiated strawerries went on the market for the first time in Florida, USA. The strawberries had been irradiated with cobalt 60 when the Vindicator, Inc. facility began operation in January. US consumer groups have already been voicing their opposition to food irradiation, with a great deal of success. Now it is generally under stood that Vindicator s main commercial target for the near future is outside the US: Japan. (Japan is already a large scale importer of Florida grapefruits and oranges) Consumer Union of Japan is coordinating a campaign against food irradiation. They are asking people to write to Sam Whitney, President of Vindicator Inc., to express opposition to the food irradiation business.

Whitney's adress:

Vindicator Inc., 1801
Thonotosassa Road, Plant City
FL 33566, USA.

For more information on Food Irradiation, contact:

FoodlrradiationNetwork(FIN),
International **Organization** of Consumers Unions,
PO Box 104540830 **Penang,**
Malaysia.

The Fast Disappearing Fast Breeder

The Indian nuclear program is based on a dream—a dream of unlimited power locked in the uranium atom. Unfortunately, or rather fortunately, we don't have too much uranium.

The only working mines that we have are at Jaduguda in Bihar and the ore there is of poor quality and is anyway almost exhausted. (See Anumukti Vol.5 No.l) What we have in plenty in the monazite sands of Kerala coast is thorium. But the energy locked inside the thorium atom is too securely locked. Thorium does not fission. What thorium does do, under bombardment from neutrons, is to transform itself into a fissionable form of uranium called uranium-233.

The pioneers of the Indian nuclear energy programme were under no illusion regarding the availability of uranium in the country. Prospecting of uranium has been done more thoroughly than that of most other minerals. Thus, the chances of a new unexpected find' are somewhat slim.

To bypass the constraints imposed by the poor availability of uranium and still develop a totally self reliant nuclear power programme, the pioneers like Dr Homi Bhabha and Dr Vikram Sarabhai conceived of a three step strategy.

The first step was the construction of ordinary (thermal) nuclear power plants. Normally when an atom fissions, it breaks up into two nearly equal bits and two or three neutrons. The neutrons that are released, move at a tremendous velocity. At least one of these neutrons has to hit another fissile atom and cause it to break up, for the chain reaction to proceed. The chances of these fast moving neutrons hitting the nucleus of another atom and causing fission are quite small. However, if they can be slowed down in some way, then the chances of their causing further fission are greatly enhanced. This slowing down of neutrons is called 'thermalising' in nuclear jargon and is accomplished by having a 'moderator' in the system. The action of the moderator is akin to that of a crowded bazaar. Neutrons loose their speed through repeated collisions with atoms of the moderator. The CANDU type reactors which are most prevalent in India use heavy water as moderator. Heavy water has an advantage over ordinary (light) . water since it absorbs far fewer neutrons. Thus, the chain reaction can proceed even when the amount of fissionable kind of uranium (uranium-235) present in the system is quite small. Other types of reactors, which use light water in their moderating and cooling systems, need to have a much richer mixture of uranium-235. However, having these thermal nuclear power plants was not a solution to our energy needs since they would soon consume all the scarce available uranium.

If the world nuclear industry were to continue and not die a well-deserved death, paucity of uranium, would within the next century, become a world-wide phenomena.

Hence the second step in the strategy: this was the construction of fast breeder reactors. A breeder reactor is one which produces ('breeds') more fissionable material than it consumes. This is possible because not all atoms of uranium happen to be of the fissionable kind. Most (993 out of 1000 in naturally occurring uranium are of the kind that do not fission (uranium-238), but they can be transformed into a material (plutonium) which is fissionable. Hence, the breeder reactors have in their core fissionable material (a mixture of uranium-235 and plutonium) which is surrounded by a blanket of the non-fissionable kind of uranium. The excess neutrons that are produced during fission are absorbed by the atoms of the blanket, and the uranium-238 there becomes converted into plutonium. The 'fast' in fast breeder reactors refers not to the speed of breeding, which is in fact, quite slow, but to the speed of the neutrons which are not moderated like in thermal nuclear reactors. Two questions arise here. Firstly, why use fast' neutrons and secondly why go through this rigmarole of first producing plutonium in a breeder reactor and then using this plutonium in an ordinary reactor with thorium? Why not directly use the abundantly available thorium in the already built thermal reactors in the first place? The answer to the question of the necessity of using fast neutrons is that while 'slow' neutrons are better at causing fission the number of neutrons released per fission on an average is more likely to be two rather than three, whereas in the case of fission caused by fast neutrons, the chances of producing three neutrons per fission are greater. One neutron per fission is needed for the chain reaction (fissioning of the next atom) and if breeding is desired, at least one neutron would be needed per fission for the purpose of converting non-fissionable material like uranium-238 or thorium into fissile plutonium and uranium-233. Since some neutrons are inevitably 'lost' — absorbed by the moderator, coolant, and structural materials like steel and concrete that make up the reactor, it is difficult to achieve breeding in ordinary nuclear reactors.

Therefore, the pioneers' strategy was: first build ordinary reactors, this would give some amount of plutonium, though much lew than the uranium-235 that would be consumed. Use the plutonium in a fast breeder reactor to have more plutonium. And once, the plutonium supply was thus assured, to convert the abundant thorium into uranium-233 and take the country into an era of unlimited power.

Whereas, the availability of uranium was a specially serious concern to India, it was not the only country faced with this problem. If the world nuclear industry were to continue and not die a well-deserved death, paucity of uranium, would within the next century become a world-wide phenomena. Thus, many countries including U.S., U.S.S.R., U.K., France, Germany, and Japan besides India embarked upon a fast breeder programme. However, like rats deserting a sinking ship, the fast breeder programmes of many countries are being wound up one by one. The U.S. and Germany have already called it a day while U.K. has announced that its prototype fast breeder reactor at Dounray would be shut down in 1994.

The French were the frontrunners in fast breeder technology. They had not only built prototype fast breeders, but also a commercial scale fast breeder. Superphoenix was the largest and so far the only example of a large commercial scale operating breeder reactor anywhere in the world. This helps explain why the French state power company, Electricite de France (EDF), is defending Superphoenix despite its dismal history-a record number of breakdowns, the fact that it has operated at full power for less than six months of its six year existence-and its enormous costs.

DSIN (Direction de la Surete des Installations Nucleaires: the French nuclear regulatory agency somewhat akin to the Indian Atomic Energy Regulatory Board, except for the fact that it seems to have more teeth) has stated that, before authorizing a startup for Superphoenix, it wants to understand the mysterious and potentially dangerous variations in reactivity that for two years have been plaguing the Pheonix, the prototype of Superphoenix. DSIN in their report have highlighted the most serious failures suffered at Superphoenix: the discovery of tubing leaks in 1987, the entry of air into the reactor in 1990, and the collapse of the machine room roof in 1990 due to snow load. All of these according to DSIN "have statistical significance for the future." They are due, say DSIN, "too difficult technical problems that have been insufficiently mastered, or failures in designing must be considered that the probability of new failures appearing is significant." And despite heavy pressure from the nuclear establishment, the government is hesitant to override safety considerations for an increasingly controversial project. Concern with environmental issues and nuclear energy is rapidly rising in France, as illustrated by March regional elections where green parties won nearly 15 percent of the vote.

like rats deserting a inking ship, the fast breeder programmes of many countries are being wound up one by one.

Now, Superphoenix will have to go through a long relicensing process for restarting. This would include public hearings, and that, say French activists, would probably finish it off. Didier Anger, national spokesperson for the French Green Party, says that unofficial ministry sources estimate that there are three chances out of four that the French government will abandon the project.

The French nuclear programme is the most extreme example of the quasi-military style of centralised administration that characterizes the French state. There is no place for separation of powers, democratic process *or* independent watchdogs in the French system. Thus, its nuclear program (civil and military) was developed by an elite government bureaucracy, the Atomic Energy Commission (CEA), acting on executive orders issued without any parliamentary oversight or involvement. The state owned electricity board EDF maintains a monopoly over all electric and gas power. Plant safety is controlled by the Ministry of Industry, but it relies on experts from the CEA Until the Chernobyl accident, monitoring of radioactivity was the responsibility of another bureaucracy which is so pronuclear that it denied the presence of the Chernobyl cloud over France. The CEA, rather than the universities, provides training in nuclear engineering, which helps minimise the number of nuclear engineers who might be critical of the industry. *{Editor's Annotation: Replace the word India for France in this paragraph and see if you can observe any difference.*)

The French government began its dramatic expansion of the country's civil nuclear program after the 1973 oil shock, provoking widespread opposition. But the government crushed the grassroots movement. In 1977, police brutally dispersed a march of 60,000 protesters at the Superphoenix site, killing one person and wounding 100 others. In 1981, when the Socialist Party came to power, promises to close Superphoenix and open a debate on nuclear power were quickly betrayed. The extra parliamentary opposition was co-opted *or* disheartened and the nuclear question was moved out of the political arena.

This began to change after Chernobyl. Until the 1986 Chernobyl disaster, most newspapers refused to publish any critical commentary on nuclear power. Immediately following the accident many journalists broadcast assurances (there was no significant increase in radioactivity over France and no reason to take preventative measures), only to discover that all neighbouring countries were destroying large stocks of vegetable and dairy products and . refusing to buy French products. The scandal led to the creation of France's first independent

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monitoring lab, the CRIIRAD, which besides monitoring Chernobyl radiation, has since discovered several significant hazards from France's own facilities. The spell was broken. And despite the media blackout, the grassroots opposition began to grow.

The nuclear industry suffered further blows in the late 1980s, as it searched for somewhere to dump its waste. It met with formidable opposition from farmers, environmentalists and local governments at three of the four potential sites it chose. As many as 15,000 protesters occupied sites and seized equipment. When attacked with tear gas, farmers fought back with tractors spraying pig manure. In 1990, then Prime Minister Michel Rocard was forced to announce a one year moratorium on new waste dumps and to organize, in June 1991, the country's first parliamentary debate on a nuclear issue. By then, environmentalists had leaked an alarming secret report on safety written by EDF safety chief Pierre Tanguy, further eroding public confidence. Among other things, the report discussed serious aging problems in reactors, important design defects in Pressurized Water Reactors, and most seriously, a re-evaluation of accident probabilities which now showed the risk of a serious accident to be at least 20,000 times higher than had been previously estimated.

The political fallout and the description in the report of the risk of accident as an important financial issue was something EDF was more concerned about than any health hazards involved. EDF claims to produce very cheap nuclear electricity, and often sells it below cost, thereby running up a debt equal to Poland's entire foreign debt. In fact, were it not for a guarantee from the French government which also holds down interest rates, EDF would be bankrupt.

The Superphoenix itself has already proved to be a major economic disaster. US$9 billion has so far been spent (six times the initial costs estimate) for a site that is still not finished or in working condition. Fuel reprocessing costs would push the bill even higher. EDF claims that the reactor will eventually produce electricity for only about twice the cost of standard PWRs, but it admits now that commercial models won t be viable until the middle of the next century.

That price estimate is misleading, since it does not take into account the costs of the whole fuel cycle, the reprocessing costs in particular. According to an independent analysis of the plutonium fuel cycle by economist Dominique Finon of the university of Grenoble, the reprocessing costs are so high that it would probably cost less to extract uranium from sea water.

The dangers of fast breeders are so great that even many otherwise pronuclear physicists oppose them. They are believed to be the only reactors in which there can actually be an atomic explosion.

The superphoenix houses more than six tons of plutonium (and CRIIRAD has already detected traces of it in the Rhone River).The dangers of fast breeders are so great that even many otherwise pronuclear physicists oppose them. They are believed to be the only reactors in which there can actually be an atomic explosion.

These dangers are inherent in Superphoenix's design, and were known well before the reactor started. With its record of actual operating experience - which includes an incredible series of impossible accidents (two of which had officially been estimated to have a probability if occurring not more than once in 10,000 to 100,000 years) - the DSIN safety authorities have understandably become publicly critical.

Growing Opposition

Despite the media blackout in France, opposition to the Superphoenix, long based in Switzerland (Geneva is only 45 miles away), has gradually grown. A recent poll in the Isere(the area where Superphoenix is located) indicated the 69 percent of the population believed that building Superphoenix had been a mistaken decision and that 78 percent thought the Superphoenix might become a second Chernobyl.

The Effect on Japan

Now that the French are not proving the ideal role-models for India, our nucleocrats are liable to shift their admiration towards the Japanese. Future pronuclear cheerleading is bound to have glowing references to the still expanding Japanese nuclear programme along with lot of blah-blah regarding the fact that Japanese are the only people ever to have suffered the effects of atomic explosions. However, the French government's decision not to restart the Superphoenix should also have a large impact on the Japanese nuclear industry.

The story regarding the French decision got little coverage from the Japanese news media, while the government and nuclear industry officials feigned indifference. PNC (Power Reactor and Nuclear Fuel Development Corp.) officials commented that their own Fast Breeder Reactor (FBR) Project Monju, which is scheduled to start next spring, would not be affected by the French decision because the difficulties with Superphoenix are mainly due to intrinsic maintenance problems and also because the loop type Monju is structurally different from the pool type Superphoenix. *{Now where have we heard that one before? Editor)*

Actually PNC was nervously waiting for the French decision, hoping that Superphoenix could be restarted. The decision came about one week later than generally expected. During this period, officials were desperately trying to get hold of all the information they could, so as to be prepared at any

time to comment that their programme would not be affected even if the decision was unfavourable. In spite of their comments, however, the French decision has a direct bearing on Monju, and they know this all too well.

For one thing, the decision not to restart Superphoenix was based on the safety report prepared by M. Laverie, chief of DSIN and the report raises serious doubts as to the safety of FBRs in general. The weaknesses and uncertainties that Laverie points out concerning Superphoenix are mainly related to the following three points:

The difficulty of controlling core reactivity. The potential danger of a sodium fire, particularly in the secondary sodium circuit.

The difficulty of inspecting the inside of the reactor vessel and steam generators.

These are problems common to all types of FBR and thus weaknesses of Monju as well.

It should be noted that the French decision seems also to be related to the prospect of a world plutonium surplus problem. In an age of surplus plutonium, it does not make sense to breed plutonium in a FBR. NERSA, the owner of Spx, decided three years ago to remodel the reactor from a breeder to a non breeding fast reactor. It can be said that the recent French decision on Spx has accelerated this policy shift from breeding to non breeding in France. Germany's decision last year to abandon the almost completed SNR 300 FBR also came years after remodeling it to a non breeder. In this context it is interesting to note that talks on the future remodeling of Monju to a non breeding fast reactor have just begun in Japan.

Ten days after the French decision, the *Mainichi Shimbun*, one of the national daily newspapers, reported that PNC had decided to convert the ATR(advanced thermal reactor) Fugen, a heavy water moderated light water cooled converter reactor of Japanese design which partly uses MOX as fuel, into a dedicated plutonium burner. This may be regarded as further evidence that the Japanese government now admits Japan is going to have a large plutonium surplus, as we have repeatedly pointed out. But the decision sounds very strange in the light of the fact that the government and PNC have always claimed until very recently that we need to breed plutonium for Japan's energy self sufficiency and we **must also have plutonium from Europe because without it we face a shortfall for fueling Japan's R & D plutonium projects. The decision to use Fugen as a plutonium burner probably reflects the change of perception which is slowly taking place inside the Japanese nuclear industry about the plutonium surplus, but the decision has apparently been expedited by the French decision on Spx. Hence the death of Spx is already affecting Japan s plutonium policy.**

Anyway, Japan is obviously going to face a large surplus of plutonium as the government itself now admits, and we would like here again to stress that there is no need for plutonium to be shipped back from Europe, even if the dangers of shipments can be minimized.

Surendra Gadekar

Sources:
WISE 371
Nuke-Info Tokyo

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33 Power Projects Facing Cost Overruns

A review of the power sector, has revealed that of the total 39 mega and major projects, 33 are behind schedule and 31 face cost escalations of 77.6 percent.

The cost of the 39 projects has jumped from the original estimated Rs 17368.1 crore to Rs 3,11,736 crore, registering an increase of 77.6 percent.

Due to project slippages, less than 50 percent additional capacity was added during 1991 92; against a target of 1,880 MW, only 908 MW was added during the period. Top officials are highly skeptical that the current year's target of commissioning 2,890 MW would be met

According to official sources, the cost of 31 projects has shot up from the original estimate of Rs 15,845.1 crore to Rs 29,715.1 crore— an increase of 87.5 per cent. The time overrun in the case of 33 projects ranges between *one* month and 128 months. The cost of these projects has risen from Rs 14,510 crore to Rs 27,046 crore.

The reasons for delay in project completion are:

Delay in environment clearance, notably for major projects including Farraka Super Thermal Power Project (STPP), Kalgoan 'STPP, Kalgoan transmission line and Doyang which are stuck with the Department of Environment.

Controversy between Uttar Pradesh, Madhya Pradesh, and Bihar over the reallocation of water from the Renusagar reservoir, delaying the Vindhyachal STPP, which the meeting felt should be resolved immediately.

Land acquisition problem is holding up Kalgoan, Farraka STPP 11, Talcher, Bokaro B 11 Majijia, Ranganadi Doyang and Koel Karo; serious funding problems for Farraka STPP 111 and Vindhyachal Transmission system.

Law and order problems in Jammu and Kashmir are delaying the Ori and Dulhasti, and the Kagalgoan and Farraka due to the Jharkhand Mukti Morcha.

6.1

Nuke Project That Failed To Take Off

The agreement between India and the Soviet Union regarding the Koodangulam nuclear centre, which has now been scrapped, was the culmination of eight years of negotiation on the technical and economic aspects of the Soviet offer first made in 1979 when then Prime Minister Morarji Desai visited Moscow.

Under the agreement, two 1000 MW units would be set up, the first by the end of 1998 and the second exactly one year later, according to the chairman of the Atomic Energy Commission, Dr. M.R.Srinivasan, in October 1988. The project was taken up by Atomenergoexport, a Soviet foreign company.

Practically all technological systems of the project were to be made available by Soviet Union. The USSR was also to provide the fuel, but India was free to get the enriched uranium from wherever it could. The spent fuel was to go back to the USSR, both because it had better storage facilities and less population and because India wanted to avoid complications regarding the weapons grade plutonium that can be derived from reprocessed fuel.

Koodangulam was chosen as the site for the reactor as it was seismic activity free, a sparsely populated area but with availability of water and proximity to the sea.

The Koodangulam project was opposed by quite a lot of people, starting with the villagers of the coastal areas. They were apprehensive that the radioactivity would harm them. Fishermen were against it because they feared destruction of marine life. But villagers in the interior were enthusiastic, trying to get the maximum possible for their lands.

Part of those opposing the scheme, the Committee for Sane Nuclear Policy (Cosnup) even decided to ask the Centre to scrap the project to set up two VVER 1,000 MW nuclear reactors, saying that they were obsolete and flawed. Cosnup convener Prof. Dhirendra Sharma said that the Soviet Union itself had suspended installation of 20 VVER reactors after the Chernobyl accident, and anyway its technology had been developed 20 years ago.

Justice V.R. Krishna Iyer, national chairman of Cosnup, also supported the demand.

The reasons for their opposition were: 1.The friends of Nature Society said there were no water sources in the arid area to supply the water necessary for a nuclear plant, and it would also be a Herculean task to link the power generated from there to the national or state grids;2) The plant was of no use to the displaced villagers as most of them were far too poor to benefit from it, having only thatched houses;3) Fishermen were afraid that marine life would be affected;4)Radiation was already high in Kanyakumari district because of natural radioactivity from the monazite deposits along the coast; and 5) Villagers and environment conscious organisations were absolutely against giving water from the Pechiparai reservoir as the area was already starved of water.

President of Atomenergoexport. said that a Chernobyl type disaster was not possible in Koodangulam because the reactors were the VVER 1000 type, not the RBMK as in Chernobyl. And only one percent of pechiparai reservoir's capacity would be required for the plant.

VVER 1000 is a water cooled and water moderated reactor, with the core in a thick metal shell with a sphered lid, preventing radiation leaks and breakdown of the reactor. It is also earthquake resistant, able to withstand a 8 point quake on a 12 pt scale. It also allows for use of sea water for cooling ancillary equipment.

The reactor has three barriers to prevent radioactivity -sealed around fuel elements, heat transfer circuit and localisation of fission products in limited space.

Project director V.S.Gopinatha Rao also reassured the fishermen, saying that coolant water would not pose any danger to marine life. He said the condensers were so designed that the water that was let into the sea would not raise its temperature by more than 5 degrees C.

All the same, objections were periodically raised,like those by Dr. Dhirendra Sharma, who insisted that VVER reactors were not safe either, as they no longer were to be built in the Soviet Union which scrapped five which had already been built.

Between the objections and the denials, the project did not really take off. In early January 1990, the then Union Minister for Science and Technology, Mr.M.G.KMenon, said that the Government of India had not taken a final decision on the plant. The Government would look into the project in its totality, including cost, economics, etc. No agreement had been entered into on a final basis with the Soviet Union, he stressed, adding that it would only be after the Detailed Project Report.

The quick changes in the Soviet Union in mid 1991, once again stalled the Koodangulam project.

As recently as December 1991, AEC chairman P.K.Iyengar said it would take two months at least to know if the reactor would be set up with Soviet help or without, due to the rapid changes there. And project director C.R.Prabhakaran said infrastructure work under the Rs.7 crore first phase was being carried out.

On December 4, 1991, Dr Iyengar asserted that the Atomic Energy Department would go ahead with putting up the four pressurised heavy water reactors (PHWR) of 600 MW each with Indian knowhow, even if the Soviet agreement fell through.

Letter Box

At you know, there it a nuclear plant of high accident rate not Car off St Petersburg. We are interested in genetic effects of the wastages from the plant Our lab tracks Down's syndrome and congenita] malformations rates in Leningrad-St Petersburg since 1982. It is very interesting to compare the dates of Urge accidents with dynamics of Down's syndrome rate in the city as a whole and in the districts of the city. However, despite 'Glasnost' information on accidents is still not available. We are making efforts to discover this information and hope to achieve success.

We have obtained information on a big accident in 1975 (See following). This accident affords the possibility of monitoring immediate genetic effects and as well the possibility of learning about late genetic effects.

In 1994, young women conceived at the time of accident in 1975 will be giving birth to their children. Marital age in Russia is 18 years, and we are waiting the start of Down's syndrome rate elevation (if the conception of irradiation influence on meiotic chromosome pairing is correct).

Unfortunately, under unlucky situation in our country such fundamental explorations usually fail to receive financial support. Moreover, we are afraid we shall have to stop our investigations in the nearest future.

Taking into consideration the significance of the problem, we hope to attract the attention of foreign scientists, with the purpose of founding international collaboration in this topic.

SUBSTANTIATION OF THE PROJECT OP EXPLORING GENETIC EFFECTS OF THE ACCIDENT ON THE LENINGRAD NUCLEAR POWER STATION IN 1975

The problem of the effects of low dose radiation on human germ cells is one of the most important in radiobiology. It it alto of great significance to medical genetics.

To date, there are a lot of indirect contradictory data that cannot elucidate the problem. That's why scientists pay special attention to accidents that could result in genetic effects in big population: Hiroshima explosion, accident in Kystym and Chernobyl, etc

But for the number of reasons, correct experiments on distant effects of these events cannot be carried out One of them is that humans can regulate childbearing taking into consideration possible consequences of irradiation . Thus, after Chernobyl accident, for instance, birth rate in old age groups of Byelorussian women, presumably most radiosensitive, considerably decreased. Hence, the most correct experiments can be carried out only in population that underwent irradiation being unaware of it (In Kyshtym, both physicians and administration knew the truth and deliberately distorted statistics.)

Such a situation occours in Leningrad on November 30th. 1975 as a result of partial core melt down. The reactor was stopped and blowed off with nitrogen through a 150 meter high chimney. All in all 1500000 Curies of radioactive waste was released into the atmosphere.

The accident was first mentioned on a closed meeting of the cabinet of ministers in March 1976 by Prime Minister Kosygin. He reported about a request of Finnish and Swedish Government of the increased level of radioactivity above their countries.

Visual analysis of synoptical maps on barometrical altitude 850 milibars and 200 milibars showed that in the period under study the S-SW air mass movement took place, and radioactivity could have passed throughout the city. More precise analysis after estimation of radioactive particles trajectory. Resulting from this scoring the regions of most pollution would be determined.

In Leningrad owing to established practice, all live births with congenital malformations am subjected to genetic examination including cytogenetic investigations. The part of affected children died soon after birth remain unexamined. Thus the significant part of children suffering chromosome diseases is registered in annals of both municipal medical genetics survey and science laboratory on medical genetics (Academic Group on Medical Genetic of Associated Member of the Russian Medicine Academy, Prof. EF Davidenkova.)

The laboratory serves 8 maternity hospitals (out of 20 such institutions of the city) since 1970. Observing the chromosome analysis records from 1974 to 1980 we revealed the elevation of the number of chromosome anomalies in 1976, next year after accident.

Analysis of the data of 1965 to 1979 published by Finnish scientists revealed the elevation of Down's syndrome rate in new borns in Finland since 1976 (Leisti et al Clin. Genet.; 1985:27,3.252 to 257.)

We are far from the proved conclusion that this was result of action of radiation of germ human cells. But we believe that the data mentioned above is the serious substantiation for careful retrospective investigation in this field.

We suppose:

1. Processing the archives (not computerised) of all maternity hospitals of the city since 1970 in purpose to determine the birth rate, the levels of child death, Still births, congenital malformations and Down's syndrome.
2. Study of anamnestic parental data (age, lace of birth, nationality, occupational hazards, obstetrical, gynecological anamnesis) in comparison with the selected control.
3. Detalisation of obstetrical-gynaecological data (in the cases of incomplete birth certificates) in maternity consultations (not computerised)
4. Study of the records of pathological archives (not computerised) for recognition of syndromes.
5. Multiparameter statistical analysis for determination of leading factors causing the

6.1

hereditary and congenital defects and estimating the role of irradiation.

It is obvious such exploration to be actual and not of common to all biology. Nevertheless in Russia we are not able to find institution interested in this problem. To our knowledge there are several international programs concerned with the effects of Chernobyl's accident on human health. We hope the outcome of the study suggested would be useful for prognosing genetic effects of such tragedies.

We appeal to you with a request to include our project in appropriate monitoring program.

The study would be completed in one year provided the financial support is $10,000.

The prospect for financing of the work and we would grateful for aid in searching possible sponsors.

Reproduced in toto from **a** letter written by a Russian Scientest

Contact V.T. Padmanabhan, CISEC, Kottamuku, Quelion.

I have taken serious note of your fast from September eleven to fifteen. I agree with you completely that integrated testing of the ECCS (Emergency Core Cooling System), a safety system should be done and not in piecemeal in the public interest. I am writing to the Center to look into this matter.

Chimanbhai Patel
Chief Minister of **Gujarat**

I have decided to undergo a five day's sympathetic fast with Narayanbhai. Work here prevents me from going to Vedchhi. We had a meeting of friends from the Manaviya Technology Forum. They have decided to observe a one day sympathetic fast on 11th September.

It would be interesting to know the reaction of the authorities. Please make diagrams and explain in simple Gujarati what an Emergency Core Cooling System is and what are the implications to safety of such callousness. Please send us some copies of leaflets.

Rajani Dave
Prayas, Mangrol, Bharuch Dist.

Editor's Comment: The AERB chief, Mr. Soman came to Vedchhi to discuss the matter with Narayanbhai but did not come to the point till they were leaving. Most of their time was spent in explaining their independence from DAE. Mr. Soman gave an unsigned document which shows that they had tried to perform some ECCS tests in February 1992, and found results not upto the designed specification. New standards were set and the repaired portions were tested in June and August 1992. Obviously, the AERB gave permission for fuel and heavy water loading before being sure that the ECCS would work in toto. The ECCS should have been tested before allowing the fuel or heavy water loading. An integrated test would mean rushing in of tons of simple water into the expensive heavy water.*

Rupa Chinai's article 'BARC Spews Radioactive Poison' (Sunday Observer. Sept.7) and 'Chernobyl in the Making' (Sept. 13) has stirred people in Bombay. As of today the BARC has not challenged a single incident or fact of the several enumerated by Ms. Chinai. A demand for the right to know and for accountability on the part of BARC is the outcome.

The Anumukti Bombay Group met at the Bombay Sarvodaya Mandal to work out an appropriate action plan. Suggestions made then and in the follow-up discussions were:

- Rupa Chinai to be supported and commended for the* service she has rendered by enlightening the public on matters pertaining to health and safety of the environment. It is a service not only to this generation but also to future ones, since radioactivity damages our genetic pool.
- Encourage Doctors to independently investigate health effects of the accidents.
- BARC disasters and its implications with emphasis on:
  - Remedial **measures**
  - **Queries (esp. about the** contaminated soil)
  - Health/Ecological Angle
  - Human Rights (esp. of the BARC casual contract labourers)
  - SARCOPs (Safety Review Committee for Operating Plants) responses to this issue.
- Dissemination of information . to the common man about the happ- enings at BARC in particular and the hazards of nuclear power production.
- Dismantling the 'Holy Cow' attitude towards nuclear issues.
- Dissemination of information to villagers around nuclear power plants of the hazards they face.
- Letters/articles to be written in Hindi/Marathi etc. to press and periodicals on the happenings at Trombay.
- Demand for an open debate on safety of nuclear power plants with an emphasis on the right to information.
- Decision to network with NGOs in Bombay, and anti-nuclear groups in India regarding BARC's fall out.'
- Inviting individuals for: suggestions & support (Letters, signature campaigns, information)

All mail may be addressed to the Anumukti Bombay Group at the Bombay Sarvodaya Mandal, 299 Tardeo Rd., Nana Chowk, Bombay.

MONAPATRAO
BOMBAY

Narayanbai's 5 days fast in response to KAPP going critical without adhering to safety norms is appropriate.

Perhaps this nonviolent **protest** in the land of Ahimsa may catalyse the authorities not to **take such a** callous attitude with regards to the public's safety.

KANTIBAISHAH
EDITOR: BHOOMIPUTRA
VADODARA.

Asian Rare Earths Ordered to close

A Malaysian court on July 11 ordered Mitsubishi s joint venture Asian Rare Earth immediately to close its plant in Bukit Merah and remove all radioactive waste and toxic chemicals from the factory.

The ruling ends a seven year suit brought by eight Bukit Merah villagers against the firm, which was 35% owned by Mitsubishi Kasei. Asian Rare Earth processes monazite to produce yttrium and other rare earth chlorides used in color television screens and other electronic parts. In the process, radioactive thorium is produced as waste, and this waste was virtually dumped in the backyard without any signs or fences to protect the residents. Local residents have suffered cancers, leukaemias, and birth defects, caused by high levels of radioactivity. The ARE case had been dubbed a Japanese pollution export by environmentalists.

This ruling was the first of its kind in which a multinational giant has been ordered to close down because of environmental damage and adverse effects on the local residents. The ruling has been a great shock to the Japanese government as well as the industry. The Ministry of International Trade & Industry immediately announced that they feel deeply regretful over the issue and summoned Mitsubishi Kesei to explain the situation. The Director General of the Environmental Agency also called in the directors of the company for a briefing. The industry has likewise shown regret, saying, when a firm wants to go abroad, it should not only satisfy the local law but also get the acceptance of the local people.

Two residents of Bukit Merah, Mr. Lau Fong Fatt and Mr. Hew Yoon Tat.came to Tokyo and visited government agencies and Mitsubishi Kasei, in an attempt to persuade the firm not to appeal and to close the plant for good. During their visit, the ARE, contrary to their wishes, filed an appeal in July 23 and applied the next day for a stay of execution of the injunction to stop operation. Mitsubishi Kasei claimed the decision had been made on the Malaysian side alone without the consent of the Tokyo office and made statement saying that we cannot help expressing out regret towards these measures taken by the Malaysian side, but will continue insisting on our basic position, which is that the plant should not continue operation unless it harmonizes with the local people.

We have yet to see the outcome of the case.

(Nuke Info Tokyo July/Aug. 1992)

APPEAL FOR INTERNATIONAL ACTION

Free Vanunu for a Nuclear Free Middle East

Send the following message supported by as many signatures
[possible to: 6 Endsleigh Street, London WC1H ODX, UK.

" We the undersigned, call upon the people of Israel and their Government to release Mordechai Vanunu from prison.

Prisoner Of Conscience

Moroccon born Mordechai Vanunu, immigrated to Israel at the age of 11, along with his parents and their ten other children. After an adolescence of poverty followed by three years of service on the Golan Heights in the Israel Defense Forces, Vanunu was trained as a nuclear technician. From 1977 to 1985 he worked at Dimona at the underground Machon II lab, Israel's top-secret plutonium separation plant.

He began to question his own work on a secret nuclear weapons programme. Like Daniel Elsberg and Robert Aldridge in the US, he finally decided to make public his Government's secret Policy for the sake of truth and democracy.

In October 1985, The London Times persuaded him to visit London where a series of British scientists became convinced that his detailed story and photographs were genuine evidence that Israel's nuclear weapons programme was far more extensive than believed, making it the world's sixth most destructive nation with as many as 200 nuclear bombs.

Before Vanunu's story hit the press on October 5, 1986, its source had been kidnapped by Israeli agents. Vanunu had been tricked by a female Mossad agent into flying to Rome. There he had been overpowered, drugged, chained, and shipped to Israel on a cargo ship.

After a trail held in total secrecy, Mordechai Vanunu was sentenced to 18 years in Prison for treason, espionage and revealing state secrets. He is now at Ashkelon Prison, where he is about to begin his seventh consecutive year in solitary confinement. Amnesty International has described his conditions in a six by ten-foot cell as "cruel, inhuman, and degrading."

Israel executed Eichmann because he obeyed the directions of his superiors, and not the dictates of his conscience, when he killed thousands of Jews. Now Israel is punishing Vanunu for doing what Eichmann did not do.

I Am Your Spy

by Mordechai Vanunu

translated from Hebrew by Maxine Kaufman Nunn

I am the clerk, the technician, the mechanic, the driver,
whom they told, do this or do that Don't look
to the right, to the left, don't eye the page. Don't look
at the whole machine. You are responsible for one bolt
only. You are responsible for just one rubber-stamp.
Concern yourself with one matter only. Don't bother
with things that are above you. Don't think
for us. Drive. Keep driving. On. On.
The great, the wise, those who understand our future,
thought:
There's nothing to worry about. No fear. Everything works,
clicks.
Our little clerk is a diligent worker. He's a simple technician.
He's the little guy.
Like all the low-ranking clerks, ears have they, but they hear
not,
eyes have they but they see not. We have a head;
not the little guys.
Answer them, he thought to himself
-just between him and himself-
the little citizen. But the man with the head
is not little. Who is the boss here, who knows
where the train is headed?
Where is our head. I too have a head.
Why do I see the abyss
Does this train have an engineer?
The clerk-driver-technician-mechanic raised
his head. Retreated a bit, saw a monster
Unbelieving, returned, rubbed his eyes and indeed -
they're fine. I'm just fine. I really do
see a monster. I am part of the system I
signed this form. And only now I am reading
the text. This bolt is part of a bomb.
This bolt is me. How did I not see
and how do others go on bolt-tightening.
Who else knows. Who saw, who heard
The emperor is indeed naked. I see him.
Why me. This is not for me. It's too big for me.
Rise up and cry out. Rise up and proclaim to this nation.
You can. I the bolt, the mechanic,
the technician. Yes you. You are the secret agent
of this natioa You are the eyes of the state.
Spy-agent, reveal what you've seen. Reveal
to us what those who understand, the wise, hide from us.
If you are not with us, the void awaits us.
A holocaust awaits us. You and only you sit
at the wheel and see the void.
I have no choice. I am a little guy, an ordinary citizen,
one of the common folk,
but I will fulfill my commitment. I have heard
the voice of my conscience. And there's nowhere to run.
The world is small. Small compared to
big brother. Here I am, on your missioa Here I am
fulfilling my role. Take this
from me. Come and judge. Lighten my
load. Carry it along with me. Carry
on my messenger-mission. Stop the train. Get off
the train. The next stop is nuclear holocaust

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Anumukti Team: P.P.Baburaj, Sanghamitra and Surendra Gadekar and Peter Patrao.

Subscriptions, donations, manuscripts, inquiries regarding circulation, etc. should all be addressed to:

Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, Dist: Surat, 394641 INDIA

Please do not send cheques or drafts addressed to Surendra Gadekar.

Published by S.Gadekar for Sampoorna

The next book, the next machine, no. There is no such thing.

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Vol. 6 No.2

October/November 1992

> *What sets worlds in motion is the interplay of diffentices, their atttractions and repulsions. Life is plurality, death is uniformity. By suppressing differences and peculiarities, by eliminating different civilizations and cultures, progress weakens life and favours death. The ideal of a single civilization for everyone, implicit in the cult of progress and technique, impovcrishes and mutilates us. Every view of the world that becomes extinct, every culture that disappears, diminishes a possibility of life.*
>
> *Octavio Paz*

A Voyage that Diminished the Possibilities of Life

First came the visionaries-the seekers after truth, the people whose insatiable curiosity and genius led them to probe deeper and ever deeper into the mysteries of nature. People like Ernest Rutherford-the giant New Zealander whose ingenious experiments using a little bit of wire and some sealing wax were to alter the whole course of scientific development in the twentieth century; there was Niels Bohr, the Danish mountaineer and footballer, who gave us our picture of the atom-the most recognisable symbol of the modern age; there were the Germans Edwin Sehrodinger and Werner Heisenberg who gave the theoretical tools-the framework to understanding the secrete of the micro world* there was Paul Dirac the Hungarian physicist's physicist and his compatriot Leo Szilard—the man who dreamed the whole enterprise up and many others. And there was Enrico Fermi: "The Italian navigator who landed on the shores of the New World and found that' the natives were friendly."

That was the encoded message which announced to the American authorities that a nuclear chain reaction had been established and that it was controllable. On December 2nd, 1942, in a laboratory constructed underneath the squash court of the University of Chicago, Fermi and his group of co-workers, forged the key that opened the vast store of energy locked inside the atom.

Uranium is the heaviest naturally found element. Nucleus of atoms of uranium spontaneously divide into smaller bits, nuclei of lighter elements, and a few (sometimes 2 and sometimes 3) neutrons all moving at great speeds. The trick was to get these neutrons to act as triggers for further breaking up of other uranium nuclei. If this could be done on a suotained basis, then that was the key to the vast store of energy. The problem was that most of the neutrons were moving too fast. They would speed away before they could hit other atoms and cause fission. Fermi put a piece of parnffin wax in the way. The wax was to act like a crowded bazaar to the speeding neutrons. They slowed down, became more amenable to capture by other uranium nuclei and the chain reaction became sustainable. Like an-

other Italian navigator exactly 450 years before him Fermi landed the spaceship earth on the shores of the new world. But were the natives really friendly?

After the dreamers came the schemers. People like General Leslie Groves, who made useful products out of these discoveries. Like weapons of mass destruction. Groves wasn't the only one. There were many others: The political leaders: The top executives of large corporations: The military men. And they weren't all just Americans either. They were to be followed by the Russians, and the British, and the French, and the Chinese; and the Indians and the Pakistanis and the Israelis and the ...

After Hiroshima, the stream of nuclear scientists divided into three. One channel went on to make bigger and better (worse for you and me) bombs. These were people like Edward Teller—first rate scientist but a paranoid personality. Then there was the other stream-a small counter current. Scientist who said enough was enough and who tried to turn the clock back from the approach of midnight. And there was the mainstream. People who thought that nuclear energy was an inexhaustible, clean, cheap and safe source of energy and a solution to all the world's ills if only it could be harnessed and put to peaceful uses.

Many ingenious peaceful uses of nuclear by-products were found. There were the uses in medical diagnosis and therapy. There were agricultural uses, and in food preservation and in all kinds of gadgets from radioactive smoke detectors to starters in energy efficient tube lights, to watch dials that glowed in the dark. And on and on... No doubt there would be many more in the future.

But the main use apart of course from the weapons that nuclear energy has been put to was in boiling water and generating electricity.

But, on this, the fiftieth anniversary of Fermi's forays under the squash court, nuclear electricity faces an uncertain future. It has in a very deep sense proved itself to be "poisoned power". The very process of fission, leads to the creation of a bewilderingly large variety of poisons. Amongst these poisons are some of the most toxic substances known to humanity. Thus for example, a small spec of plutonium weighing no more than a trillionth of a gramme lodged in a person's lung can cause cancer. Nuclear power plants produce such poisons in quantities of hundreds and sometimes thousands of kilograms. Keeping these poisons isolated from the environment for essentially eternity has proved to be an insurmountable task. Far from being "too cheap to meter", nuclear energy has instead turned out to be too costly to continue. Despite huge government subsidies, (totaling according to the government's own estimate to more than $ 40 billion by 1979 in U.S.A. alone, nuclear power has failed the market test and no new power plants have been ordered for the last eighteen years. Neither has nuclear energy been as safe and clean as its backers had claimed. Catastrophic accidents have taken place far too frequently and routine emissions have proved to have been far more harmful than previous expectations.

But as advocates of 'development' never tire to point out, there is no free lunch; somebody has to pay the price. The price has been paid disproportionately by the voiceless—the yet unborn generations, the indigenous people of remote regions where all the uranium mining and the bomb testing have taken place, by young children and by women. Dr Rosalie Bertell winner of the Right Livelihood Award has estimated this price as the untimely deaths of 32 million people.

Christopher Colombus had also found the natives friendly. The natives paid for their friendliness with the destruction of their lives and culture. The track record of nuclear colonialism has been much worse.

Congratulations Dr Gofman for the Right Livelihood Award

Dr John Gofman is one of my heroes. He did his Ph.D. in nuclear chemistry and then went on to become a medical doctor. Today, at 74 years of age, he is Professor Emeritus in Molecular and Cell Biology at the University of California at Berkeley.

While a graduate student in 1942, Gofman proved the fissionability of uranium-233 and developed the process which isolated the first workable quantity of plutonium and discovered several radioactive isotopes of uranium and protactinium. His pioneering work on the chemistry of lipoproteins has received several medical awards.

But good scientists, though not dime a dozen are still not very rare entities. Far more than being merely a good scientist, Dr John Gofman is a man of scientific integrity and has courage of his convictions. Thus, when he found that the health effects of low, officially 'acceptable' doses were in actuality killing millions of people, he put his entire 'career' and funding on line and said so. For his outspokeness, he was hounded by the radiation establishment. His books, *Radiation and Human Health, X-Ray3: Health Effects of Common Exams* and *Radiation Induced Cancer from Low-Dose Exposure* are all classics in the field. *Anumukti* is eagerly awaiting the yet to be published book on heritable health effects.

Allaying Public Fears

In the last issue of Anumukti, we mentioned that the Kakrapar Atomic Power Plant (KAPP-1) started functioning from the 3rd of September, 1992- Shri Narayan Desai had gone on a five day fast in protest against the starting of this unit without the mandatory safety testing. The fast has galvanised many in the vicinity of the plant to become active in their opposition to the plant. As part of our campaign, we had informed the local press and local and state level politicians of the implications of starting KAPP1 without fully testing out the Emergency Core Cooling System. When Shri Narayanbhai announced his decision to fast, this was conveyed to the State Government and to some political leaders in the state. The Narmada Development Minister, Shri Babubhai Jasbhai Patel, forwarded Shri Narayanbhai's letter to the Prime Minister along with a note of his own. The Prime Minister's reply dated October 9, 1992 reads:

Dear Shri Patel,

Thank you for your letter of September 7,1992.

You may have received by now the clarification sent to you by Dr. P.KJyengar, Secretary and Chairman, Atomic Energy Commission, at my request. A copy is enclosed for ready reference.

I hope you will be able to use your good offices with the Sarvodaya leader, Shri Narayanbhai Desai, to allay his apprehensions.

Energy is vital for our progress. Nuclear energy is one of the most important energy sources available to us. Safety systems are important in all industrial undertaking and our approach to them should be positive and constructive. As you will notice, the safety systems in KAPP-1 are supervised by the Atomic Energy Regulatory Board and the expert committees it has set up to monitor the detailed operation and testing. I am glad Shri Desai is taking such a keen interest in the nuclear power plant. I am certain that his misgivings will be allayed by the Atomic Energy Regulatory Board. The Chairman of the Atomic Energy Regulatory Board, Shri S.D.Soman will be available for any further clarifications if required.

With regards,
Yours sincerely
P.V.Narasimha Rao

We also reproduce Dr P.K.lyengar's letter in full

No.6/6(14)/92-PP/789
September 8, 1992

Dear Shri Patel,

We have seen your letter dated July 28, 1992 addressed to the Prime Minister regarding Kakrapar Atomic Power Project-I. The question of adequacy of safety systems in KAPP-1 is decided by the Atomic Energy Regulatory Board and the expert committees that it has set up to monitor the detailed operation and testing. It is only after their approval that KAPP-1 attained criticality. A monitoring mechanism by an independent group has been established for this purpose, and the Department of Atomic Energy relies on their verdict. The Nuclear Power Corporation is responsible for the construction and operation, and is subject to the approvals given by the Atomic Energy Regulatory Board

In this connection, we may point out that individual opinions could be coloured and that is the reason why a committee of experts is asked to decide on such issues. Leaders in society should also value the opinion of such experts before coming to decisions on the social implications of such safety measures. I am sure that the Chairman, Atomic Energy Regulatory Board. Shri S.D.Soman, will be available for anybody who wishes to get clarified on any problem with regard to KAPP-1.

With regards,
Yours sincerely,
P.K.Iyengar

AERB Chief Visits Vedchhl

We received this letter much after Shri Soman's visit to Vedehhi.

Shri Soman spent one and a half hours with us. His major point too was to show that AEHB was independent of the Department of Atomic Energy (DAE). As proof he offered AERB annual report which is a separate document and not part of the annual report of DAE. However, on questioning he admitted that this was the first year in which the report had been published separately and previously AERB 's report used to form part of the DAE report. Shri Soman and the other officials who had accompanied him, did not say a word about Emergency Core Cooling System (ECCS) in KAPP-1 till they were just about to take leave and had in fact stood up to do so. At that time Shri Soma n brought out an unsigned note (on plain paper not AERB stationary) and handed that over with the comment that testing of the ECCS had been " done in an integrated fashion" at KAPP-1 and found to be satisfactory. On being asked "then how come Shri Natarajan and Shri Ghosh (who are both members of the AERB constituted safety committee) had written their note," he made no reply. He replied in the negative when asked if he (Soman) had called Shri Natarajan to ask him why he

(Natarajan) had written such a note when the ECCS had been found to be "satisfactory".

After the visit to Vedchhi, a press release was issued by KAPP authorities claiming that "Shri Soman had set all Shri Narayanbhai' s fears at rest." Whereas, during the visit, he evaded giving a direct answer to the only question that Shri Narayanbhai put to him, that was "Does the AERB or the DAE consider the health and safety of the people living in the vicinity of the plant, to be their responsibility?"

Reply to the Prime Minister

The following is an edited text of the letter written by Shri Narayan Desai to the Prime Minister, which was forwarded by Shri Babubhai J Patel along with a note of his own. What I have edited out are portions which summarized Dr Iyengar's letter, since we have reproduced the original letter in full.

Dear Pradhan Mantriji,

I am thankful to you for your letter October 9, 1992 in response to Shri Babubhai Patel's letter in connection with my fast.

At the outset, let me confess that Dr. P.K Iyengar's letter that you have enclosed with your's is far from convincing.

Dr. Iyengar wants us to have faith in experts. It mast be noted that both Shri K,Natarajan and Shri Ghosh are 'experts', being members of the AERB constituted safety committee specially charged to take care of the safety aspect of the Atomic Power Plant in question. They are the very people whose opinion the AERB and hence ultimately DAE are supposed to respect and impiement. To my knowledge no representative of the DAE or the AERB has repudiated the substance of Shri K.Natarajan's note,-that integrated testing of the Emergency Core Cooling System (ECCS) as per design intent was not done in toto before the KAPP-1 was actually started. All that Dr P.K.Iyengar has done is to imply that there are differences of opinion in the committee, and the committee as a whole including presumably Shri Ghosh and Shri Natarajan have acquiesced in allowing the reactor to start.

In this connection, let me recall the facts regarding the point at issue, about which there is no dispute.

. l. ECCS at KAPP-1 was tested in Februaiy 1992.

2.The test showed that the system did not function as per design intent.

3.Parts of the system which malfunctioned were, probably, repaired and retested in June and August '92. However, full integrated testing of the entire ECCS was not undertaken.

. 4.Thus, whether the ECCS would function as required in an emergency situation is at present unknown and a matter of speculation and hope.

5. ECCS testing, in fact, could not be undertaken since the AERB had already given its permission for fuel loading and heavy water loading in the primary heat transport system. An ECCS test at that stage would have meant that heavy water worth hundreds of crores of rupees would have become contaminated and downgraded and hence useless for reactor purposes.

Let us be aware of what is at stake here. In case the ECCS does not function as required in an emergency situation, we would have a major disaster in South Gujarat, which would deal a crippling blow not only to the state of Gujarat but to the economy of the entire country. The example of Chernobyl (another instance which the experts claimed could never happen) is already before us.

In such a situation, I would like to submit that, if at all we could afford to make an error, the error has to be on the side of safety. I do hope and pray that there will not be an accident or a leakage of radioactivity in KAPP-1, but as responsible representatives of the people it is your duty to see that no action is taken that would endanger the safety of the people living around the Power Plant in any eventuality.

I must also point out that "independence' of AERB hardly has a meaning when we consider the fact that there have been numerous instances when DAE has gone ahead and done whatever it wished to do, being confident that AERB would retrospectively approve, and AERB has always done so. A case in point is the December 1991, massive leak of radioactivity from a pipe in the CIRUS reactor complex in BARC Bombay, reported in a series of three articles by Rupa Chinai in *The Sunday Observer.* Since the area where the leak was detected is criss-crossed by numerous other pipes, the Reactor Safety Committee recommended that all pipelines carrying radioactive effluents be tested, repaired if necessary, and confirmed to be no longer leaking before starting CIRUS reactor. The apex safety body, 'SARCOF which is directly related to AERB, gave its permission to start the reactor, subject to fulfillment of the stipulations of the Reactor Safety Committee, on 5th February '92. The reactor was started that very evening without the conditions being fulfilled. That very night, one of the fuel elements suffered damage releasing large amounts of radioactivity into the coolant system, which had to be pumped out through the pipeline which was known to be leaking and had not been repaired. This instance is a clear abdication on AERB's part of its regulatory responsibility and illustrates the contemptuous attitude in which this body is held by officials of DAE. AERB has till now not publicly reprimanded anyone for this violation.

Before concluding, I would like to quote from the report of the Kemeny Commission, which was set up to investigate the causes of the Three Mile Island accident in USA. in March 1979.

"After many year's of operation of nuclear power plants, the belief that nuclear power plants are sufficiently safe grew into a conviction. One must recognize this to understand why many key steps that could have prevented the accident were not taken. The Commission is convinced that this attitude must change to one that says that nuclear power is by its very nature potentially dangerous, and therefore, one must continually question whether the safeguards already in place are sufficient to prevent accidents."

I would, therefore, request you to note the seriousness of the matter and not to be guided solely by the advice of these experts, especially when experts seem to differ so drastically with each other on a matter that could have catastrophic consequences.

With kind regards
Narayan Desai

Comments

It is the duty of responsible public servants to allay public misgivings regarding various facets of government policies The best and in fact the only way in the long run to do this, is to openly confront problems, honestly investigate, make the results available to one and all, so that the general public becomes a partner in the governance of the country, and ordinary people feel that they have a say in policies that affect their own lives. Instead, what we have is that "Allaying Public Fears" is a game which politicians and "experts' play with gusto. Our leaders **tell us, whom can we trust if not the experts. The head expert tells us, you cannot trust what a single or in this case two experts say when they feel that no outsider is listening, but you can only trust the public statements of a committee of experts. It is well known from all walks of life, that experts are capable of good advice only at times when their own personal interests are not at stake. Whenever there is money to be made or the prospect of career advancement are apparent, doctors advice unnecessary operations, teachers advice unnecessary tuitions, engineers approve unsafe structures, nuclear regulatory bodies approve of untested designs. In such a situation, public safety can only be insured not by relying on the opinions of expert bodies, but by the activities of an enlightened citizenry.**

Recently, following the flurry caused by reports regarding the high prevalence of disease and deformities around the Rawatbhata Atomic Power Plant, the Department of Atomic Energy has decided to conduct a survey of cancers amongst their own permanent workers and their families at Tarapur. Such a survey is unlikely to come up with any thing of significance for the following reasons:

l.The 'healthy worker effect': The permanent staff of any industrial undertaking including nuclear stations is better fed and has generally abetter standard of living and health than the population at large. Thus, even at Ilanford, studies have shown that nuclear workers as a group have less number of cancers than the general population. It is only when comparisons are made between groups that are comparable, that one can get sensible results.

2.Tampur is a bad choice for such survey since, there are many other confounding factors present. There is **a** lot of other industry nearby. A good number of the nuclear workers don't live **at** Tarapur but commute from Bombay, etc. Thus, even if one finds something significant, one would not know what to attribute it to.

3.The permanent staff of nuclear power plants, by and large does not do the really 'dirty jobs. That honour is conferred upon the hapless 'casual' workers most of whom live in the vicinity. These poor fellows are not considered as nuclear workers except when the question of the applicability of radiation limits comes up. Thus, though they probably receive the largest doses of radiation, their health is not regularly monitored, nor are any records kept. In case a comparative study was to choose its control group from this sample, peculiar results are bound to come up since the presumable unaffected group would in reality be the more affected one.

However, even despite all these problems with a study at Tampur, DAK still wants to do such a study of its employees, the way to do an honest study would be to not look only at effects like cancel which take decades to show up, but at the general pattern of disease and deformity and then try *to* see if this pattern was in some way peculiar and not found in other truly comparible groups. That way mething could emerge that would I e of real benefit to the workers Unfortunately, the purpose of DAK studies is not to be of use toanyone, but only as a tool in the game of 'allaying public fears',

Surendra Gadekar

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(We apologise for being grounded!)

The Uranium Concentration Camps

In Europe, as in America, the postwar call to arms forced a rapid expansion of the uranium mines of the Erzgebirge, employing many tens and ultimately hundreds of thousands of miners. Recently discovered documents reveal that following a secret agreement in November of 1945 the Soviet Union was granted exclusive rights to all the uranium mined in Czechoslovakia. These mines in Bohemia were greatly expanded under Soviet supervision and began producing ore for shipment to the east. Bohemia was destined to become the primary source of uranium for the Soviet Union until the 1960's, when large deposits were discovered and developed in Kazakhstan and Central Asia. The Schneeberg mines of Saxony were also revived under Soviet occupation: uranium ore figured as part of the war reparations paid by the East Germans to the Soviet Union.

In the 1950's, about the same time that U.S. health authorities began to take the problem seriously (at least at the level of research), Czech health officials began to study the health effects of uranium mining. Health records and vital statistics were gathered on uranium miners, coordinated by a Health Institute of ' the Uranium Industry, established in the mining town of Pribram in 1954 for this purpose. As in the U.S., Czechoslovakian efforts to publicize the health problems of the miners ran up against cold war fears that releasing such information would compromise national security. In I960, Dr Vladimir Rericha of the Health Institute of the Uranium In dustry was asked to prepare a comprehensive overview of the incidence of lung cancer among Czech miners. Between 19G0 and 1965, Rericha and his staff compiled elaborate epidemiological evidence that miners at Joachimsthal and Homi Slavkov were dying from lung cancer about five times the rate of coal miners and the general male Czech population — results that were similar to U.S. findings at this time. Rericha prepared a paper detailing his findings for the Health Institute in 1966, and simultaneously sought to publish his results in a more conventional scientific journal.

Rericha's efforts to publicize the carnage in Czech uranium mines were blocked By orders of the State Security Police. The report and its contents were classified and publication was barred in foreign or Czech periodicals — a ban that was not lifted until the Velvet Revolution of 1989. The logic behind the ban was extraordinary: as Rericha today recalls it, Czech security authorities said they were afraid that from uranium health statistics, one could calculate either uranium production levels, or the quality of uranium being mined, or both. For this reason, all information on rates of cancer in uranium miners was declared "top secret." The cynicism of such a ban, even on its own terms, was made apparent to Rericha in the 1970's. when he again tried to publish his findings. Rericha was again denied the right to publish, despite the fact that the administrative chief responsible for all Czech uranium mining defected to the West in 1970. With all the details of Czech uranium mining available to Western intelligence agencies, why were the health hazards of uranium mining still kept secret? One can only conclude that the Czechoslovak Authorities feared that revelation of the sacrifice of the country's miners for the sake of Soviet atomic power would not have gone over well with the Czechoslovak people.

The Czech uranium mines (where uranium was first identified and exploited) are well known. Not widely known (even to Rericha and his colleagues) was the fact that the Czechoslovak government organized 17 to 20 concentration camps at the three major uranium mines, in which tens of thousands of political prisoners were forced to work in the 1950s and 1960s. All of the prisoners forced to mine uranium were political prisoners. The scale of the prisoner camps was approximately equal to that of "civilian" employment in uranium mining. According to Secret Police Archives, numbers of political prisoners at the uranium concentration camps were:

Year	**1951**	**1952**	**1953**	**1954**	**1955**
Prisoners	**9,029**	**11,280**	**11,816**	**9,655**	**7,974**

The Number of Political Prisoners

By 1960 the number had dropped to 2,600, and by 1963 the political prisoners had been replaced at the concentration camps by a population of criminals.

Compared to civilian miners, the political prisoners bore the brunt of the hazard and received practically none of the compensation. Civilian miners were paid extremely well — about ten times the average salary of physicians, for example. But the concentration camp inmates were fo**raed** labourers, and the vast majority did not survive to enjoy the compensation that **was** finally awarded in 1989.

Robert Proctor

6.2

Where Have All The Babies Gone?

1**he** British Medical Journal of 9th Februaiy, 1992 (vol.304 pp 343-6) carries **a** study by Prof. R.KAVhyte of McMaster University, Hamilton, Ontario, Canada which demonstrates **a** correlation between atmospheric atomic bomb test in the 50s and 60s and rise in infant mortality. Until now such correlations have been denied by all international radiation-protection bodies (like ICRP, UNSCEAR, BEIR) and health authorities world-wide.

High Statistical Correlations

The high statistical correlations indicate that there was an excess of 320,000 infant deaths in the period 1950-1980 in the USA and UK alone. All first day infant deaths, neonatal deaths (within the first 28 days) and still births were included in this study.

As an example, this graph shows the first day neonatal mortality (deaths/1,000 live births) for England and Wales and USA plotted against calendar years. Before 1950, (the beginning of the atom- bomb tests) the curves show a deviation: the mortality rate no longer continues to decrease but even increases slightly. After the cessation of the bomb tests in 1963, the mortality rate begins to decrease again, following a delay, until the curves at the end of the 60's resume the trend seen before the bomb tests. Similarly shaped curves were also **demonstrated for the excess** mortality in **the first** 28 **days after birth and the number** of **still births.**

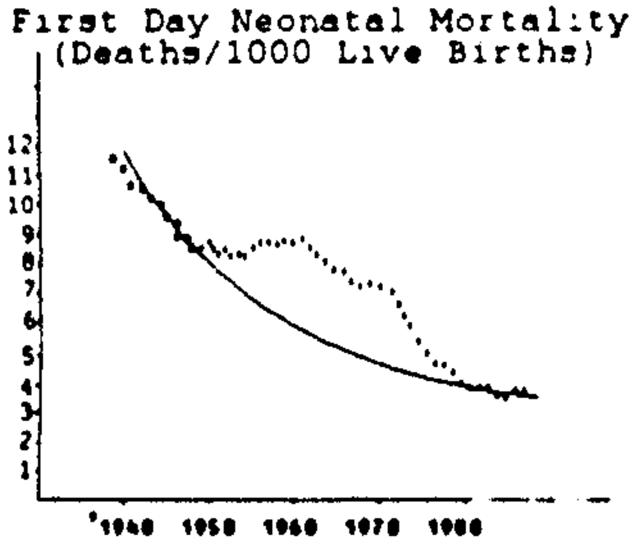
Confirmation of Previous Studies

More than three decades **ago, Prof EJ-Sternglass had already drawn** attention to such **a** correlation between physical and mental damage to humans and both the fallout from atom-bomb tests as well as emissions from nuclear power plants. The latter, even under normal operating conditions, also discharge atomic fission products similar to those found in fallout, such as strontium-90, iodine-131, carbon-14, tritium, krypton-85, etc. In his paper, Whyte also cites a study from Sternglass published in 1969 which demonstrates close geographical and temporal correlation between the increased strontium-90 pollution, as a result of the atom bomb tests bet ween 1950 and 1963 and an excess in infant mortality. Whyte also cites another study by Prof Jens Scheer of Bremen University, who showed that there was a 35 percent increase in infant mortality in southern Germa*ny* after the Chernobyl incident. Today there is a wealth of laboratory and epidemiological studies dealing with the effeets of Gillout and low-level radiation on humans, animals and plants. All these findings should hopefully at last influence the radiation protection lawmakers.

Consequences for Society

In a memorandum on the implications of the Whyte study, Dr Sterglass says that in USA alone, 280,000 additional infants have died from 1950 to 1980 as a direct result of atom-bomb tests. Today, there could be millions of persons aged 10 to 45 years who have been harmed by the atomic bomb tests because some ten times more underweight babies survived which, nonetheless, frequently showed physical and mental problems. Therefore the greatest health and economic damage through fallout would not be increased rates of leukaemia **and** cancer among children, but instead an increase in premature and under-weight births. This would result in increased infant mortality, impaired pregnancy and immunological deficiencies in children that survive (though Whyte does not discuss immunological deficiency in his paper). For every thousand live births the number of underweight babies is some 100 times greater than that of children dying from cancer and leukaemia.

A recently published study by the Ukrainian parliamentary commission, shows that just six years after Chernobyl, there has been a distinct increase in cancer amongst children, a large increase in birth defects and growth problems in both Ukraine and Byelorussia. In addition, it was pointed out that two to three and a half times more children are suffering from immunological deficiencies than before 1986.



Risks Underestimated

Therefore, according to Whyte, the health risks from fallout (any fallout whether from bomb-tests or from nuclear accidents like Chernobyl or

from the routine emissions from formally' operating nuclear power plants), have been underestimated by between 100 and 1,000 times because the radiation protection levels have only taken account of cancer and genetic defects! These 'acceptable' limits are based on the Hiroshima-Nagasaki data, which was the result of a single short-duration radiation burst. Such radiation damage is more easily repairable in contrast to the indirect damage caused by free radicals which takes place at low levels at low dose rates.

Supralinear Response Curve

The data from Prof Whyte support the growing evidence that in order to arrive at a maximal allowed concentration of fission products in milk, drinking water and foodstuffs, a linearextrapolation from high and externally received radiation doses like that of the Hiroshima victims is unsuitable. It follows that the most sensitive sectors of our society are insufficiently protected, namely the developing foetus and the elderly who both have weak immune defenses. Today it is irresponsible to still deny the supra-linear effect of radiation in the low dose region. Furthermore, the variations in radiation sensitivity among the population due to different factors like age, sex, illness, genetic composition, etc. have not been taken into account in the radiation protection laws.

Shut Down All Atomic Power Stations

At the end of February, 1992 the first International Conference of the newly formed Association for Radiation Protection took place in Kiel, Germany. It's theme was: New Assessment of Radiation Risks. Over 300 scientists and doctors took part in the gathering. The conference adopted a statement which was drafted by Prof Horst Kuni of the University of Marburg and the Otto-Hug Radiation Institute. The statement said, *"...we consider it safe to say that the collective dose released, as a result of the operation of atomic power stations, is sufficient to result in significant health risks to the employees as well as the general public."* It called for a total shut-down of all nuclear power plants.

Ralph Graeub

Ralph Graeub is a chemical engineer and a member of the Radiation Safety Group for the Swiss section of Physicians for Social Responsibility.

ATOMIC DECEPTIO A
OH, WHAT A TANGLED TOM
IC DECEPTION:
OH, WHAT A TANGLED WEB!

"The national security state that the United States has evolved toward since 1945 is significantly a denial of the American democratic vision: suspicious of diversity, secret, mcuiial, exclusive, monolithic, paranoid"

Richard Rhodes,
The Making of the Atomic Bomb

The Indian State is walking down the same antidemocratic path that the United States has traversed. Thus, it is interesting to know and note the similarities in the policy of lies and official deception and denial of access to knowledge that both states have followed. The following is an account of the 'war' the U.S. government waged on its own citizens in the name of "national security". Using the Freedom of Information Act, Hanford Education and Action League (HEAL) has gained access to once classified information on the governmental policies which allowed the secret releases of radiation into the air and the Columbia River. A number of these 'techniques' of information management have been used and are still being used also by the Indian nuclear establishment.

Hanford managers did take many precautions to limit exposures to radioactive and toxic materials. They were not totally cavalier, as some suspect. Radiation protection was a major concern in the design of the reactor and chemical separation

plants. But there were mistakes, there were accidents, and people took chances with the health of others. Instead of confronting these imperfections and working honestly to correct the situations, the government adopted an official policy of cover-up. It feared the public's reaction to the truth and the loss of the ability to build atomic weapons.

An aspect to reflect upon is that the public's awareness about Harford's radiation did not start with the release of the once classified documents in 1986. There were rumours about Harford's radiation dangers as early as August 1945. Rumours continued throughout the fifties and sixties. The other noteworthy aspect is the fact that the government is still making it difficult for citizens to have access to historical documents about Hanford. Thus, while much has been learnt since 1986, still more remains concealed, and the government is working actively to keep its own citizens in the dark.

Was Ignorance the Cause?

During the past eight years, many scientists and Hanford officials have said that the reason the large radiation releases from Hanford were allowed was due to incomplete knowledge among early Hanford scientists of the dangers of radiation. However, this comforting view is not true. The documents reveal that the officials knowingly exposed workers and the public to levels of radiation exposure which they themselves considered dangerous. They routinely ignored their own guidelines regarding atmospheric releases of radioactive iodine till early fifties and dumped radiation into the Columbia river right up to early 1960s.

The reason for operating Hanford's factories in this manner are not entirely clear. But it is fairly certain that during the Second World War, the desire to win the war as quickly as possible provided the main push. According to Hanford's first operations manager, Walter O Simon, "the pressure was tremendous." But after August 1945, the reasons are murky at best. The highest releases during 1945 occurred after the Japanese surrender, when apparently there was no hurry'.

It is not as if Hanford officials did not take any precautions—they did. Within the plutonium facilities, they constructed the ventilation systems to suck the contaminated air away from those areas occupied by workers. Another precaution was the high emissions stacks on the separation plants. Simon recalled, "We did worry about gas emissions when the uranium from the reactor was dissolved to separate the plutonium. We monitored them *very* carefully, and ... if there was a good wind velocity to distribute them, we might have taken some chances ..." They monitored the wind and would generally not release radiation if the conditions did not dilute the plume enough. Wakefield Wright, a chemical operations supervisor, has stated: "before you could dissolve in those days you had to worry about wind conditions ... They didn't want the wind to be in the direction of Tricities although they were 30 to 35 miles away. If we started dissolving and the wind got bad, we had to quit."

If the officials had taken these precautions, then why did they allow radioactivity releases which violated their own guidelines? From the available documents, it appears that even with all their precautions, they discovered that they could not obtain enough plutonium while operating the facilities safely. Even though Japan had surrendered and the war was over and there was no other nation which possessed atomic weapons, the government felt that they had to have more bombs. Therefore, the officials continued to operate the plants in ways they knew were dangerous anil decided that the public could not be told the truth. They adopted deception as government policy.

How Did Hanford Cover It Up

In one word, by lying. A 1955 address by Hartford's chief health official H.M.Parker to a United Nations meeting on the peaceful uses of atomic energy, held in Geneva, provides an excellent example of how Hanford deceived the world. In the course of his talk, Parker mentioned "a single emission of 100 curies of iodine-131 in a few hours". The declassified documents now show that the actual amount released was nearly 80 times more than his version. In a similar vein, Parker also. talked about another release of 100 curies of radioactive particle, which was carried off-aite. What Parker did not tell his distinguished audience, was the fact that the it was ruthenium (a longer lived radionuclide) that was being released, it traveled further than Spokane (more than 125 miles downwind) and the actual release amount was 360 curies.

Security: The Culture of Secrecy

During World War II, Hanford "was such a hush-hush operation that even the amount of ice cream consumed by the workers was classified " At the start of the Manhattan Project. the military adopted a security system known as compurtmenUiligation. Individuals would only be told what was necessary to perform their tasks. Parker wrote that security could be maintained "if hazand *infonnation is phrased in such a manner thai the maximum information on the nature of the hazaed is combined with the minimum infonnation on the nature of the materials used and the processes uneolved."*

The culture of secrecy was nearly a total preoccupation with Hanford workers and their families. The Federal Bureau of Investigation (FBI) maintained an ominous presence in the workplace* and in the neighbourhoods of Hanford workers. One worker commented, "There have been cases of men talking or telling their wives more than they should. There are a lot of FBI men working in the areas. We all know when a guy starts getting careless, and it isn't very long until he is not around any more." To share concerns about Hanford's operations meant dismissal and ostracism.

Public Relations: The "Suppress Officer"

Milt Cydell, Hanford's public relations officer during and after World War II, was commonly referred to as the "suppress officer".

When the first atomic bomb was dropped on Hiroshima and the

workers at Hartford learned about the nature of their work, the rumour mill went into high gear. Harry Petcher, a food service worker at Hanford during World War II recalled "When the bombs were dropped my recollection was, God, is that what we were doing here? Did we get poisoned?" Hanford officials worked quickly to reassure the workers that building the bombs was safe.

Depending upon their audience and message, Hanford officials changed their tune. Writing two weeks after the atomic bombings, Parker and another key health official, Dr Simeon Cantril, wrote a memo to the workers stating that "we don't want any misinformation by the misinformed to mar either our record or the morale we have built up through confidence in the safety of our operations." In answer to concerns about Hanford's effect on the public living near Hanford, Parker and Cantril calmed the workers by stating: *"The amounts of radioactive iodine in Richland are entirely innocuous."* Less than three years later, the same Parker, writing an internal memo, would refer to the "entirely innocuous" levels of iodine as being high enough to have caused "concern in 1945." A year later in another internal memo, Parker made another reference to the "entirely innocuous" levels of iodine: "In *1945 iodine1945 contamination of vegetation was 45 to 70 times accepted permissible maximum at Richland and Kennewick."*

Medical:
A Profusion off Sad Stories

On June 9, 1952, Ernest Johnson died in his Richland home after becoming ill at work. He was a mamtenance foreman at one of the plutonium production reactors at • Hanford. He had not been feeling well that day and seen his doctor in the afternoon. As the funeral home prepared Johnson's body, several suspicious marks were discovered on his skin. Knowing that he had worked at Hanford, the funeral home called the General Electric medical department. (General Electric Company were the operators of Hanford under government contract.-Editor)Because the injury could have been connected to Johnson's work, G.E. decided that an autopsy should be done but not by its own pathologist. Dr Frederic Davis, the pathologist for Walla Walla, was called to perform the autopsy. Davis was assisted by three Hanford (G.E.) physicians. The cause of death was listed as ruptured aorta near the heart. Johnson had a history of high blood pressure. The autopsy report could not explain the marks on his skin.

Johnson's widow, Marie, was suspicious of how he had died. Some of his co-workers had told her that her husband had been heavily exposed to radiation in the months leading up to his death. (The official Hanford records do not indicate this high exposure.) When Marie took her husband's body back to Chicago for burial, she had a second autopsy done. This time the autopsy surgeon considered the burn marks to be the result of radiation exposure. Marie Johnson began the process of filing a claim, contending that on the work radiation burns had contributed to Johnson's death.

The Atomic Energy Commission (AEC) refused to consider the possibility and organized a team of its own medical and legal experts to travel to Chicago in an attempt to get Dr Thomas Carter, who performed the second autopsy, to alter his opinion and not find radiation as the cause of Johnson's death. He was even threatened with legal action if he did not change his opinion. However, despite all the threats, Dr Carter remained steadfast. Having failed to move Carter, AEC felt compelled to discredit his testimony. In order to do this, the AEC arranged to have an "unbiased" review done of both the autopsy reports. However, AEC manipulated to have Dr Simeon Cantril, as the third and decisive referee. However, Cantril was far from unbiased. He was an AEC consultant since 1943, and was also the person who had helped in the preparation of the first autopsy report. The state of Washington accepted the findings of this review and denied Marie Johnson's claim.

Eighteen months after Ernest Johnson's death, Hanford official Dr W.D.Norwood claimed to a Seattle newspaper, "*We have neverv to our knowledge, had any sickness due to radiation...*"

Legal:
Defense in Depth

The documents show that from the very beginning, Hanford was aware that people would file legal claims when they found out what Hanford produced. In February 1945, Colonel Franklin Matthais, Hanford's wartime commander, wrote in his diary that he "inspected the meteorological and radiation monitoring setup and the recordings that are being taken to permit us to be prepared in case of claimed serious exposure in certain areas." He made the following noting in his diary on July 6, 1945 "I asked him to set up some procedure that would assure us of getting first information on any question that might lead to a legal claim." Mattias' paranoia regarding people suing Hanford went so far as to require a shepherd to sign a waiver before being allowed to herd his sheep to pasture near Hanford. He also asked state and federal government officials to sign secrecy oaths.

Science:
The Complicity of Silence

The hazards at Hanford were not a complete secret for many in the scientific community. At various times, the government set up consultative groups, made up of acientists and officials from private businesses, industry and the universities. To the Hanford management, their role was purely public relations.

This consultation with outside "independent" experts does present an apparent problem: if there was anything really dangerous about Hanford, wouldn't these outside scientists have alerted the public? Most of the people on these advisory committees were from companies that either had or wanted AEC contracts. The scientists knew that as long as they kept supporting the party line that the radiation being released posed no harm, they could keep their position and professional reputation. When certain conscientious scientists violated this cozy arrangement by asking too many questions or by coming to different conclusions, the establishment would launch, a campaign to discredit them—the isolated individual verses the established order. The experiences of many former AEC experts like *Dr* John Gofman are well documented.

Environmental monitoring reports are models of scientific deception. From 1946 to 1957 they were issued quarterly, but access was strictly limited to those people.who had the proper security clearances. In 1958, the quarterly reports were con**verted into annual reports and issued as unclassified documents. However, all detailed information available in previous years, became only general information about environmental impact.**

Another way in which scientific deception was practiced was by changing the places from where samples were collected. Even when the monitoring reports were classified as 'secret', officials were careful not to report the worst news. During the fifties, as more reactors were added along the Columbia river, the radioactive concentration the river water increased several-fold. Until 1954, the quarterly reports included three readings-one along the north bank, one in the middle of the river and another on the south bank. Due to a channeling effect in the river, the south bank usually gave a reading 2 or 3 times higher than the north bank reading. Starting in 1955, the quarterly reports only mention one Hanford reading, and it is obvious that the lower north bank reading is being used.

Another method used to obfuscate reality concerns the various assumptions used in calculation radiation exposure estimates. For example, in the fifties there was much concern over the radioactivity in whitefish in the Columbia. Compared with other species, whitefish concentrates more radioactive phosphorus, which was one of the key components of the radioactive effluents from Hanford. From 1959-64, Hanford reported doses to the bone from phosphor us-32 for an "average" individual; and from 1964 to 1966 for a "maximum" individual. What is intriguing is that while the "average" person ate much less fish than the "maximum" (10-25 pounds was considered average, 90 pounds for the maximum), the "average" person caught his/her fish in water that was more heavily contaminated. Hanford placed the fishing hole for the "average" person at the point of nearest approach to the reactors whereas the fishing point for the "maximum" individual was placed further downstream where the radiation is diluted by another two rivets joining Columbia.

The Deception Continues

Most of this article has focused on the deception during Hanford's first twenty years for which there is more information available. But the policy of deception has continued right up till the present.

Jim Thomas
HEAL Perspective 10 -11
Summer/Fall 1992

World Uranium Hearing and IInd Global Radiation Victims Conference

In September '92, two important antinuclear meetings took place. The World Uranium Hearing held in Salzburg, Austria from September 13th to 19th. and the IInd Global Radiation Victims Conference, held in Berlin from September 21 to 20. Both the conferences aimed at bringing together people who have been a fleeted by all aspects of the nuclear fuel cycle and weapon's testing—often indigenous people—and activists and more academically oriented "experts". The World Uranium Hearing was actually set upas a series of "hearings" at which "witnesses" gave testimony to a board of "listeners", while the Global Radiation Victims Conference was a more conventional sort of a conference.

I was lucky enough to be invited to attend both events and a subsequent speaking tour arranged by the World Uranium Hearing at different places in Germany, Others from Australia included activists

from Melbourne and a group of aboriginal people from Maralinga, where the British tested nuclear weapons in 1960s.

The World Uranium Hearing was a high-profile event designed primarily to focus attention on the affect uranium mining has had on the indigenous people worldwide, though its concerns were not limited either to indigenous people or to uranium mining. There were testimonies from non-indigenous activists such as myself and from 'experts' with specific knowledge of particular aspects of the nuclear fuel cycle and weapon's testing programmes.

Nevertheless, the emphasis was on indigenous people. Testimony was received from American Indians, Canadian Inuit (Eskimo), Kazakhs, People from Chupotka and Novaya Zemlya in the CIS, Peru and Brazil and from small Pacific Islanders, Australian aboriginals and from India. India was represented by people from Meghalaya and Jaduguda in Bihar and Dr Dhirendra Sharma from Delhi.

The World Uranium Hearing was an occasion to be remembered. It was extraordinarily well-funded for an environmental gathering with solid support from the city government of Salzburg, as well as the provincial and national governments. The proceedings themselves were at the old university in the medieval centre of Salzburg, while meals were had in the new residency palace('new' here means 16th century), under chandeliers with chubby baroque angels flying overhead.

But it was memorable for far more than the setting. It brought home to an Australian activist the very resl nature of the problems and the suffering caused by the nuclear experiment.

An example: As the conference drew to a close, it transpired that we were to be taken to the slopes of Grssblockner, the highest mountain in Austria, for the final act. When we were taken there, it was in the most expensive-looking, hi-tech tourist buses that I have ever seen, let alone traveled in. (Let us leave aside for a moment the fact that one of our hi-tech buses broke down due to a subtle software malfunction). Who, I wondered paid for these buses? It turned out that the bus company is giving us this ride for free. Why are they doing that? Well, they are in the business of taking people up to the snow... and in May 1986, after the Chernobyl accident, the snow was 100 times as radioactive as is considered 'safe' for people, and the company suffered badly. Now, the proprietor is thoroughly opposed to nuclear power. There were many other small examples like this.

But what created the most impact at the hearing, were the testimonies themselves. There were stories of heroic and successful resistance and there were stories of prolonged deep suffering.

Joan Scottie, an Inuit from Baker Lake in the frozen arctic north of Canada, gave an inspiring account of her community's successful (so far) resistance to the establishment of a massive new uranium mining project at Kiggavik by the German company Urangesselschail.

A variety of American Indian representatives told of the effects on their people of living on lands by the side of the tailings piles of many now defunct uranium mines, and of the so far very feeble efforts by the U.S. government at cleanup.

People from Novaya Zemlya gave an impassioned account of the Soviet and now Russian government's persistence in using their ancestral hunting grounds as a place to conduct nuclear testing.

One thing that came across very clearly to me was that there seems to be some mysterious link between peoples' social and political status and their geology that makes the land of indigenous people uniquely suitable for uranium mining, as a site for nuclear power plant, for nuclear waste disposal and for nuclear weapons' testing. The truth of course is, that governments think indigenous people as simply expendable. People who can be quite literally bulldozed or cheated into accepting almost anything. The same treatment meted out to say, residents of Paris, or Moscow or Delhi or Sydney instead of Tahiti or Novaya Zemlya or Maralinga or Meghalaya, would provoke a political crisis that would terminate the programme.

Research and lobbying in Australia just doesn't prepare one for the sheer emotional impact of all these real life stories, and often my wife Mishka and I were moved to teare. We weren't expecting to hear such tales of prolonged, intense, and wholly avoidable human suffering, not only from the indigenous victims of the nuclear industry but also from many who had once worked in it.

An example of this was the testimony given by a worker from the U.S. weapons' industry, who described the effects on his health. Here a large part of the pain came not only from the sickness caused by radiation exposure, but also from the years of being lied to, by his employers and government.

The crowing example of an industry insider-Victim' came in the inspiring testimony given by Vladimir Chernousenko. Chernousenko is the person who led and supervised the clean-up effort at Chernobyl. He is presently dying from the radiation exposure he received while doing his duty in constructing the sarcophagus at Chernobyl. He subsequently wrote a number of articles and a book giving a highly critical insider's view of the Soviet/C.I.S, nuclear industry. For him, fighting

the industry is a race against the effects of radiation on his own body.

Evidence from India came from activists from Meghalaya and Bihar.

Mr Hoppingstone Lyngdoh and Rev. Basaiawmoitof the Khasi Jaintia Environment Protection Council spoke about the new plans for uranium mining in Meghalaya, Mr Xavier Dias and Mr Areeparampil spoke about the impact of uranium mining in Singhbhum district of Bihar. Besides, there was Dr Dhirendra Sharma from Delhi.

At the conference in Berlin, there were reports from many scientists, including Dr Alice Stewart and Dr Rosalie Bertell and Professor E.T.Sternglass amongst others. The Berlin conference was dominated to some extent by the large contingent from C.I.S. who gave reports on the effects of Chernobyl and of the nuclear bomb testing at Semipalatinsk in Kazakhstan. However, many of them were somewhat 'establishment' and often talked all around the subject instead of being straightforward.

A few questions do hover around the conference. World Uranium Hearing spent $15 million on its delegates[1] travel, accommodation, and food, plus faxes, phones, translations, photocopying, etc, Was it money well spent? $1*5 million, I believe, will certainly stop uranium mining in Australia. It would do much to stop the world-wide spread of nuclear industry, if farmed out to grassroots activist groups. However, it is a fact that this money was forthcoming for the World Uranium Hearing, but not otherwise. And, also that the Hearing did make an impact on the mainstream media.

Towards the end of the hearing, the Uranium Institute issued a 'brief* ing', in which it tried to detail all the 'benefits' of uranium mining to local communities. This briefing seemed very incongruous after the whole week had been spent listening to the 'beneficiaries' talk detailing suffering.

Finally, it must be said, that the indigenous people brought to both the conferences a deep spirituality and a holistic value system that contrasted very sharply with the institutional values of power and money. We will need these values as well as the hard data that we have had for years if we are to win the war against nuclear power and its fuel cycle.

John HaIlam
Friends of Earth
Sydney

Petra Kelly: World Citizen

First a letter from a friend:

No, it cannot be suicide. Petra Kelly and General 'Bastian were people who stood and worked for a cause, against odds, on issues most others would not take a stand or get involved in* They were concerned at the growing arms trade, the nuclear industry, industrial pollution and the problems of refugees, especially the Tibetians.

At our first meeting, Petra Kelly had personally come down to identify and take me inside to her office next to the German Parliament in Bonn, as the guards would not let me in, without my passport for identification.

In November 1988, when we were participants at the Nehru Centenary Conference on Nuclear Weapons-Free and a Non-Violent World in New Delhi, she had quickly obtained an appointment with Rajiv Gandhi at the lunch hosted by the late PM. One of the issues they had discussed during the more than 45 minutes discussion had been the nuclear industiy, especially the fast breeder reactors. That evening both General Bastian and Petra Kelly had told me that Rajiv Gandhi seemed concerned and wanted more information.

Petra had expressed her concern at the consequences of German unification. When she had lost her seat in Parliament, she had sent a letter introducing us to her successor in Parliament, from the former Eastern Germany. She was simple, easily approachable and a dear friend to all concerned people around the world.

The Environment and Peace Movements have lost two great friends.

Hemchandra Basappa
Documentation & Dissemination
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Nehru Nagar Bangalore 560020

Death of Petra Kelly is a great shock. She was like a shooting star- a brilliant burst of light in the night sky. Anumukti pays tribute to this world citizen by reproducing bits from her writings.

A Power Shared With Others

As we once thought of the physical world as separate bodies, acting on one another primarily by collision, so we thought of the social world, too, as changed only by coercive forces.

Many of our resources have to do with our own daily life, with e way in which we live, with the way in which we change ourselves. The tradition within the peace movement of seeking to live one's politics and attempting to move one's life into closer accord with the values of non-exploitation, liberation, freedom equality and mutual aid are the most important elements in disarming and in creating peace around us....

The depth of our own change cannot happen in one single day, this change must be renewed every day and continue all the rest of our life.

We are looking for a new power, powershared with others, not power exercised to gain control over them. Feminism, ecology and non-violence belong together and are interrelated. But at the same time, we must be watchful that, while we struggle together against the big war, the little war in our everyday life is not forgotten — the little war being waged against the weak, the handicapped, the elderly, against children and women. All of us must be concerned with both levels: the big and the little war waged against us as individuals, against smaller countries, against the planetary environment, every single day. Resistance to war, to the use of nuclear weapons and nuclear energy is impossible without resistance to sexism, to racism, to imperialism, and to violence as an every day pervasive reality. There is a very profound relationship between the fact that many women and children are commonly attacked, beaten up, and raped, and that a nuclear war as well as a nuclear catastrophe threatens this entire planet Earth, which has no emergency exit.

UNPO (Unrepresented Nations and People's Organisation represents minority groups, indigenous peoples, and occupied territories not officially recognized by the United Nations. From their reports on human rights violations, it is evident that Western governments in particular and Western people in general have little or no awareness of the continued extinction of indigenous peoples. In over half the countries of the world, people are detained or imprisoned without trial; tortured or even executed for their race, gender, cultural, religious, social and environmental beliefs; and for their protest through non-violent means.

Human rights and environmental issues are and must be inextricably linked. "Without respect for people, people will have no respect for other species. Without an equitable and ecologically sustainable distribution of the world's wealth, there are no ecologically sustainable societies."

The ecological movements and the green parties must work towards advancing human rights in a far more radical way than has been the case, there is much to learn from indigenous societies, which have a harmonious relationship with land and nature, and simple lifestyles which offer models of what alternative and ecological societies could look like.

And What About Our BAnd What About Our Bomb?

Recent reports in the press have highlighted Pakistani efforts at acquiring a nuclear weapons capability, following the showing of a documentary film in the U.S. In this report we examine the some of the work being done in India in the same Held. The report is excerpted from a long article by David Albright and Mark Hibbs which appeared in the September 1992 issue of *The Bulletin of Atomic Scientists.* The May issue of the same journal carries a long article on the Pakistani bomb efforts. We shall in future be printing news regarding the Pakistani nuclear programme more regularly in Anumukti.

The "Peaceful" Explosion

No one has questioned India's ability to build atomic bon\bs since 1974, when it detonated a 12 kiloton "peaceful" nuclear explosive in the Rajasthan desert. Although Indian officials claimed the explosion was geared toward exploring such things as enhanced mining techniques and underground engineering tasks, it was clearly intended to develop a weapons' capability. Raja Ramanna said in his recently published autobiography that participating "in the development of a prototype weapon lent me a special status."

The plutonium for the 1974 test was produced at BARC in the Cirus research reactor, a 40 MW reactor supplied by Canada that began operating in 1960. This reactor can produce about 9 to 10 kilogrammes of weapon-grade plutonium a year.

Canada supplied the Cirus on condition that it be used for peaceful purposes only, but Canada did not require International Atomic Energy Agency (IAEA) safeguards on the reactor or an accounting of the amount of plutonium the reactor produced. India claims that its agreement with Canada did not preclude the use of Cirus produced plutonium for "peaceful" nuclear explosions.

The Cirus plutonium was chemically separated from the irradiated uranium fuel in the nearby Trombay plutonium separation plant, which began operation in 1964. Currently most of India's supply of weapons plutonium is believed to have been produced in the Dhruva reactor and separated at Trombay, with only a small amount of high quality plutonium produced in unsafeguarded power reactors and separated at Tarapur.

India is estimated to have an inventory of about 290 kg of plutonium available for manufacture of nuclear weapons by the end of 1991. Based on the Department of Atomic Energy's annual reports we believe, that almost all of this plutonium is in separated for

In the absence of information about the amount of plutonium needed for an Indian bomb, we assume it to be about 6 kilogrammes, a higher than normal value. Thus India has enough plutonium for at least 50 bombs.

Uranium Enrichment

Till as late as 1988, DAE had been denying that it had built a new uranium enrichment facility at Ratnahalli near Mysore? Now, in an interview, Dr P.K.Iyengar, director of Department of Atomic Energy (DAE) told Nucleonics Week that while India had successfully operated a 100-machine centrifuge cascade at Bhabha Atomic Research Centre by 1985 itself, we built the new facility to further develop the technology,"

Well placed Indian sources said that the Ratnahalli facility was not included in the list of nuclear facilities recently given by the Indian government to Pakistan, and that Pakistan, convinced that India had built a second centrifuge plant, had registered its objections in New Delhi after the two countries exchanged lists. According to sources, construction of the Ratnahalli facility already underway in 1987, was subject to delays and took about four years to complete. One western official said production of enriched uranium product at Karnataka was "very recent" and likely began no earlier than mid-1990.

The enrichment programme could be part of a long term programme to build thermo-nuclear weapons. Though these weapons rely on the fusion of hydrogen (deuterium and tritium) for most of their explosive yield, the process is started by atomic blasts. Although plutonium or weapons grade uranium is used in the "primary", which provides the initial blast, only weapons grade enriched uranium can be so located with the thermonuclear fuel to provide an extra "kick" to get the fusion reaction going.

Advanced Fission Designs

Although India has reiterated that it has not built or deployed nuclear weapons since 1974, it has maintained and expanded the complex of laboratory and industrial support activities essential to a nuclear weapons programme. Because India has made progress in fissile materials production and processing, and in the production of other important materials, it is believed to have designed nuclear devices that are smaller, lighter and more dependable. One U.S. official said that India is continuing to do more research on design than Pakistan.

One indication of Indian aspirations in advanced designs is BARC's interest in beryllium metal. The use of beryllium makes possible the design of smaller, lighter and more advanced nuclear weapons. The minimum amount of plutonium *or* highly enriched uranium required to sustain a chain reaction or "critical mass "can be reduced by surrounding the core with a neutron reflector, and beryllium metal is hard to forge and cast, and hot-pressing creates higher quality parts.

Boosted and thermonuclear weapons

India also makes tritium, which means that it could be exploring tritium based neutron emitters or tritium boosted fission weapons. Weapons experts however, believe that the development of boosted weapons would require full scale tests.

Although Indian officials have denied trying to manufacture an H-bomb, indirect indications of such a programme include lithium 6 purification and production, and an extensive inertiaI confinement fusion (1CF) programme at BARC. An ICF facility would be useful in the study of the high-energy, high density physics associated with thermonuclear explosions, the improvement of elaborate weapons design computer codes, and the development of sophisticated diagnostic techniques and instrumentation.

Dellvery

In addition to combat aircraft able to deliver nuclear weapons, India is developing nuclear capable missiles. Agni can carry a pay load of 500 to 1000 kilogrammes *over* a . .rango of 1,000 to 1,500 kilometers. This missile is large enough to hold a nuclear warhead and reach targets in China *or* Pakistan.

The economic and political costs of a decision to move forward on these weapons could be high. Besides draining valuable resources needed for economic development, deploying a nuclear arsenal would lead to Chinese and Pakistani countermeasuree. In the long run, India's security would be reduced.

David Albright and Mark Hibbs

Nuclear India: A Dream Gone Sour

This film is a powerful inducement of India's nuclear programme. Some of its images, especially of deformed children- touched me greatly. For the last two years, I have personally known the plight and misery of some of these children. I have not been able to make any difference in their wretched existence. Therefore, a film which would make this awful condition known to the whole world and hopefully force our ruling class out of its uncaring caccoon should have been a source of some satisfaction. Unfortunately, this is not the right film to bring justice to the victims of our nuclear madness.

The reason why, inspite of its strong visuals the film fails is because it is based on a fundamentally flawed concept. It seems to say two things, both of them wrong. One, that if the "rules" are properly followed, then nuclear power can be run 'safely', and two that nuclear enteiprise in India has failed because it is being carried out in India—this poor benighted land where people know no better than to drink water from leaks in radioactive effluent carrying pipelines and farmers are still ploughing their fields using hand held ploughs. The film glosses over the fact that nuclear enterprise has been a total disaster everywhere. Thus, we see the stereotype images of a bullock cart moving in the foreground, with the nuclear power plants forming the background. The commentary rubs this in with that if the same level of radioactivity as observed on the beach sands of Kerala were to be observed in Britain, it would mean immediate evacuation. While this may be true, the impression that the British nuclear programme is somehow safer or less dirty is not. Nobody is in a better position to appreciate this fact, then the maker of the film, James Cutler, who was the person who exposed the dirty linen of Sellafield.

The film is wrong on another count. It makes a great point of saying that the film was made clandestinely. This point is emphasised more than once, and is mentioned in connection with the all pervading secrecy surrounding the nuclear programme in India. I do believe that the Indian nuclear establishment would not have allowed the film to be made. But I also think that neither did the producers make any attempt to do so It would have been better if they would have shown the same discretion in their presentation that they showed in filming.

The Indian nuclear programme is, in reality, a dream gone sour. The people living near nuclear establishments are not its only victims. We all are. We are saddled with a power source that does not, will not and cannot deliver the goods. Only the bads. The film with fine depiction of the contrasts between government claims and the reality on the ground does make one think. Unfortunately, its tone, is apt to raise one's patriotic hackles. This is a pity, since the major issue should have been one of social justice to the victims.

Subscription information

Rs. 25/- per year (6 issues) for South Asia
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
(Rs. 300/- per year if paid for in India)

Rs. 250/- for life (only within India)
Demand drafts should be drawn on the State Bank of India, VaIod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/- as Clearance charges.

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Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampoorna Kranti Vidyalaya
Vedchhi, District: Surat, 394 641
INDIA

Please do not send cheques or drafts addressed to Surendra Gadekar
Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printry, Ahemedabad

PRINTED MATTER BOOK POST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Vol.6 No.3 December 1992 / January 1993

The Worst Danger

Labour's exploitation is not the worst danger,
Police beating is not the worst danger,
Greed and betrayal of trust are not the worst dangers,
.. .The worst danger is to be overwhelmed
by the peace of the grave
To lose one's capacity to react with sensitivity,
accept everything quietly,
to leave home for work, and then return home from work,
The end of our dreams
This is the worst danger.
The worst danger is that eye
which sees yet coldly ignores everything.
Whose sight loses the capacity to kiss the world with love and
which is lost in the blinding stream of happenings...
The worst danger is the moon,
which after every massacre rises in the quietened courtyards
But does not dig in your eyes like hot chillies,

Struggle will bring
beautiful designs for the embroidery of our sisters,
struggle will appear
as milk in the breasts of our wives,
struggle will become
glasses for the eyes of our old mothers,
struggle will smile
as a flower on the graves of our dead.

Avtar Singh Posh
(Translated prom Punjabi)

From The Editor's Desk

Anumukti in the Time of Troubles

The last few months have been a terrible time; a time when everything seemed topsy-turvy; a time when all of us appeared to have given way to a collective frenzy; a time when reason was lost and an irrational rage and fear reigned everywhere. A time to be ashamed of.

And yet as Dickens said of another turbulent era, "it was the worst of times, it was the best of times."... Shining like jewels in a sea of horror are innumerable stories of courage and sacrifice. People like Jamu Behn in Rander, Surat who single-handedly stared down a large crowd and saved four of her neighbours; or of the muslim brother whose neighbour a Hindu grocer ran away to save himself from mob-fury alter handing him the keys of his shop; this man proceeded to open the shop and sell goods and after peace was restored and his neighbour returned, restored to him, the entire proceeds. Or the Muslim girl who refused to accept the nasty circumstances that her friend would not be able to appear in examinations since the school they both went to was located in a muslim area; and who therefore went to her friend's house alone at a time of tension to invite her to come and live in her house. The parents of the Hindu girl were apprehensive and asked the Muslim girl to come back with her father. Well, the father accompanied his daughter back and assured the family that they had nothing to fear and could safely send their daughter to his home; and now both of them were living together in a Muslim home and preparing for their exams... Stories of Hindus saving Muslims, Muslims saving Hindus. No, I am putting things badly. They are tales of ordinary people exhibiting extraordinay courage to save fellow human beings.

Chandrashekhar, one of my students, raised a question that continues to bother me. The whole country is burning, he said, and yet you continue to talk about nuclear energy. The question of communal harmony is more vital. We should quit everything else and try our best to restore sanity.

No doubt communal harmony is vital. But then does sanity mean just the mere absence of communal or other civil strife? Does it not mean a striving for a just society where irrational schemes like nuclear power and large dams and military and the like are impossible? The major sites of the current bout of madness have been large industrial cities like Bombay, Surat, Ahemdabad, Calcutta, Kanpur... Places where a vast rootless underclass is forced to live in inhuman conditions just to eke out a living. The roots of continuing violence are not basically religious but are actually related to the disorientation and dehumanization caused by this monster of development and the idea of a'hard' STATE. There is the builder lobby setting fire to slums so that they can get hold of the land. There are the goondas trying to terrorize and extort 'protection money'. There are the politicians who are thinking of the next elections and how all this fear and hatred is going to come handy then. And there are 'decent' middle class families who are sick of all this rioting but who have in the past been so engrossed with themselves that they have not bothered to share their joys and sorrows with their neighbours and in fact don't even know who their less well off neighbours are. And isn't combating all this, what *Anumukti* is all about?

However, the bold declarations need to be tempered by a dose of realism. The disruption caused by the riots, and more especially the uncertainty, has been a great hindrance. The greatest problem has been the mails. For a whole month since December 6, we did not receive any mail at all, and after that it has been somewhat sketchy. I have started realising what isolation means.

Our printing schedule is no longer a schedule. It is a joke. To get back to some semblance of regularity, we plan to bring out two issues together. Unfortunately, there is no way for us to know if you are receiving the issues or are the mails just as bad at your end. So if you do get this issue could you please drop us a line and let us know that order has returned to our land.

Three Cheers for Clinton's Budget Proposals

President Clinton in his "State of the Union Speech", came up with some very fine proposals which ought to be emulated by our finance minister. Most praiseworthy was the idea that one cannot go on increasing the national debt. It is time that one said enough is enough and took solid measures to curb the debt. Clinton found 150 'useless' public spending programmes. I am sure we can find more. One of the programmes that Clinton found useless and unworthy of government support was research and development *of nuclear power.* Is Narasimha Rao listening?

"The Way of Science is to Seek the Truth"

A Reappraisal of India's Cloak and Dagger Nuclear Policy

In the last issue of Anumukti, we had reviewed a video film "Nuclear India: A Dream Gone Sour" which had been shown recently on British television. This article by Anthony Tucker, the former science editor of The Guardian is a serious reevaluation of the Indian nuclear programme in the light of experience. It appeared in The Pioneer from New Delhi on January 29, 1993. It is heartening to note that such a reappraisal of the Indian nuclear programme is taking place all over the world. It is a pity that Indian nucleocrats are yet immune to world currents.

1 Europe and in North America, even before Chernobyl, the cocoon of secrecy and public deception that, from the outset, surrounded and protected nuclear power programmes had been systematically stripped away. It took two decades of investigation by the media, of activity by peaceful truth-seeking organisations like Pugwash, noisy activity by antinuclear protest groups, agonising reappraisal by Governments and the self sacrifice of a handful of courageous whistle-blowers — all of whom knew that they could expect to be treated savagely, as indeed many were.

Yet the nuclear industry, even where shown to be uneconomic, technically unjustifiable or socially irresponsible, its continuing nuclear weapons link publicly exposed, still interprets criticism as unpatriotic hostility and seeks to confound or obfuscate any evidence that might damage its former image. Even in the United States, where nuclear power is effectively dead and investigators have the advantage of a Freedom of Information Act, the industry continues to defend its last niches of secrecy irrespective of the fact that these often have direct relevance to worker and public health. It is as if the nuclear industry still believes itself to operate by divine right, without any need to be publicly responsible.

Thus, even in the wake of Chernobyl and in countries whose political systems require Parliamentary accountability, the unraveling of nuclear power programmes has only slowly revealed the extent to which they have obstructed investigation and minimised problems while dominating and unbalancing national energy investment programmes. Every national nuclear programme has rested, often to a great extent, on information manipulation, on the imposition of arbitrary secrecy, and on systematic public deception on matters of cost, technical achievement and promise. Worst of all, because of the huge costs of commitment, programmes have in many countries evaded public criticism by the concealment or understatement of health, engineering and environmental problems. India is not alone in this nuclear trap: the difference between the situation in India and that of Europe and United States, is that in India the cocoon of concealment remains dangerously intact.

This message emerges repeatedly in "Nuclear India: a Dream gone sour" screened by British Independent Television in September. Of course, it was compiled clandestinely for, under the rule of secrecy imposed by the Indian Government, **it** could be compiled in no other way. Inevitably it has infuriated **the** Nuclear authorities in India elsewhere and, since it presents a short, simple and fragmentary account, it is not free of error. Nuclear hawks will pick at it voraciously.

They will say, for example, that single measurements of high gamma radiation do not prove serious contamination, and that anecdotal evidence of malpractice in radiation monitoring does not prow failure in health physics control. Further, neither cases of workers with chest and back keloids nor the fact that some villagers near nuclear planus have a high incidence of genetic malformations, necessarily demonstrate causal connections with the nuclear power programme. Hut when all these factors recur and combine in a single investigation around nuclear sites, the circumstantial evidence of malpractice becomes compelling, if not overwhelming.

To those with knowledge of radiation protection standards, of health physics, of worker and public epidemiology, the evidence implies serious failures in duty of care and unforgivable laxity by the Indian nuclear authorities in many sectors of management and control. This is a terrible indictment, made more terrible in the programme because it seems that the nuclear authorities in India may be deliberately exploiting the profound ignorance of radiation hazards among workers and villagers.

> This indictment would have dismayed and sickened the pioneers of the Indian nuclear programme. Dr Bhabha was open and proud about what India was doing. Evidence of profound health effects would have prompted him to ask for open investigation

This indictment would, I am sure, have dismayed and sickened the scientific pioneers of the Indian nuclear programme. We need to remember that they were driven by the purest of ideals. Some who read this may have talked long and quietly with Homi J Bhabha on the slopes above Trombay in 1960s, as I did when the Indian nuclear dream was being born out of incredible difficulties. India presented a peaceful face but everyone knew, even then, that an important political and defence requirement was a route to nuclear weapons.

Not everyone realised that India could have taken the alternative route to weapons of uranium enrichment-a route which needs no civil nuclear power programme as a cloak off peace. South Africa has taken this route and, inevitably, India also now has this additional weapons technology. Thus there is no longer a unique military imperative behind the Indian civil nuclear power programme. It should be judged solely on its civil achievements, economics and hazards.

Of course, historically it matters that the dream of nuclear pioneers required a true balance between future civil and military needs in India. But Dr Bhabha demanded, and initially possessed, not only impeccable technology, but management and control powerfully insulated against political pressures. Everything, he said, would be dedicated to achieving industrial, social and national benefits while minimising any adverse impacts. He chose the plutonium route based on the inherently 'safe' Candu reactor technology-and a completely internalised fuel cycle with both uranium and thorium in mind-for reasons that seemed morally and technically irrefutable at the time. The dream died the moment it was dispossessed of its political independence.

That India's nuclear pioneers, along with many other countries, were deceived in their beliefs of low cost electricity and great social benefits, is an observation of hindsight. The central point is that, as a great scientist, Homi Bhabha was open and extremely proud about what India was doing and why it had to be done.

It follows that evidence of concealment of profound health problems in and around India's nuclear plants, would have sought urgent and open investigation. The way of science, he would say, like that of all honest men, is to seek the truth.

No country that perceives itself to be under nuclear threat will voluntarily abandon its own nuclear weapons programme although, in time good will and diplomacy will surely find routes towards nuclear weapons-free zones. Nor can any programme involving enormous investment of national resources be halted overnight. Changes of direction are especially difficult if a Government is in the grip of self seeking advisers whose role is to reinforce and expand, by every means, commitment to existing policy, irrespective of its true worth to the nation.

However, misdirection may all too easily become evil in situations where informed criticism is silenced by secrecy law, and where academics and representatives — however intellectually honest in principle — are manipulated by Government control of their financial support and tenure. In such situations the intellectual fabric of society becomes so corrupted and enfeebled that the outcome is likely to be disastrous, economically, technically and socially.

Recent history tells us of the tragic speed with which economic and social disorientation can overtake a major power suffering from suppression of criticism, with its associated self-de-caption and enfeeblement and impairment of judgment. Chernobyl was as much a symptom of this sickness as an avoidable international disaster (and a demonstration of the inadequate powers of the International Atomic Energy Agency). One way or another the truth about the failure and mismanagement of nuclear technology — and about defects in the scientific, technological or medical fabrics that permit mismanagement—will emerge.

What can and what should India do now that its nuclear programme is under the spotlight of international concern and seemingly grossly flawed? First, she must have the courage to investigate openly, perhaps through the WHO environment arm. If things are awry, she must put them right. Remember, too, that wherever civil nuclear power has come under open economic and safety scrutiny, it has been found to be excessively expensive, unacceptably hazardous, or both. Open societies are only just recognising and taking seriously the health, waste, investment distortion and other burdens imposed by their once much-wanted nuclear programmes.

India's nuclear problems may prove ingrained and intractable, but the country has great richness of skills and many other energy options. Hydro and other benign sources await proper investment together with the deeper involvement for her world level physicists, chemists and engineers. Even if nuclear-related health problems can be adequately controlled, nuctear's outrageous resource demands are themselves a potentially lethal ailment for the nation. Socially crucial opportunities are being missed. Surely Bhopal should have taught India that concealment offers no solution to health, technical or political problems.

Anthony Tucker The Pioneer

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Editor's Note:

I would like to add just a few comments to this article, which expresses *the Anumukti* position rather well. The first is an observation. The immediate reliction of the nuclear establishment to the recent disclosures of radioactivity leaks from Bhabha Atomic Research Centre, and the general rise in newspaper scepticism regarding Department of Atomic Energy handouts has been to propose changes in the already draconian and infamous Atomic Energy Act of 1962. The new amendment makes it unnecessary for the nuclear authorities to obtain the Attorney General's permission before prosecution. Doesn't this remind one of *"the intellectual fabric of society becomes so corrupted and enfeebled that the outcome is likely to be disastrous...."*

Apropos the suggestion in the article regarding investigation of health problems through WHO, I feel that there is no dearth of competent and honest expertise in Indian universities and medical institutions which can and should carry out such investigations. There is no need for us to ask multinational bodies for help in carrying out tasks which ought to be the prerogative and the duty of local institutions.

Hydro has been mentioned in the article as a 'benign' source. Now hydro, especially in its micro and run of the river forms is indeed one of the most safe and inoffensive way of producing electricity. Unfortunately, in India our engineers think of hydro only in terms of giant dams, which by no stretch of imagination can be considered benign.

Surendra Gadekar

Haunted Houses: Living Within Wails of Radiation

For most people, radiation remains an abstraction, difficult to comprehend, talked about in technical terms and restricted to nuclear power plants and other military and industrial nuclear facilities.

For the people of Taiwan that reality is changing fast. Beginning since July 1992, there have been a series of discoveries of radioactively contaminated housing structures in Taipei that is making the Taiwanese question as never before the security of their own homes. To date ten buildings constructed between 1982 and 1985 have been discovered to have been built with irradiated reinforcing bar. — ("rebar"-the steel rods used to support concrete). These structures have become known to the Taiwanese people as haunted houses; with their invisible killer lurking inside.

In late November, the threat spread for the first time outside of Taipei, to the city of Taichung, where anti-nuclear coalition for Taiwan members investigating for irradiated rebar discovered extremely high radiation levels not inside a structure, but in its iron front gate and door. This new discovery has two major implications. That the possibility of radiation in buildings must now extend beyond Taipei to the whole island, and that it no longer can be confined to rebar; all types of iron and steel products regardless of their manufactured date may be contaminated.

On July 30 of last year the atomic energy council (AEC) received an anonymous letter from **a** resident of the Taiwan power company workers dormitory in Taipei, stating that the dormitory was showing high radiation levels and demanding an investigation. On investigation the AEC found, 14 apartments to have radiation levels up to 76 millirems per hour. That level is 6500 times the safety standard of 100 millirems per year for public exposure set by the International Council of Radiation Protection (ICRP). When compared to Japan, Taiwan's nuclear neighbour, we find it 130000 times the Japanese suggested standard.

Two weeks later, on August 15, news broke that the Min Sheng Villa apartment in Taipei also had high radiation levels. Investigation showed that of the 70 apartments, 34 had radiation levels similar to those in the Taipower dormitory.

More cases followed. On September 5, the Energy Commission building at the Ministry of Economic Affairs was also discovered to be contaminated (Not a few people claimed this ironic justice). Four days later, another 7-story building in Taipei was found contaminated. This time the AEC refused to reveal the name of the building.

It soon became obvious that the Atomic Energy Council was not prepared or not willing to deal with this crisis. It was not until October 7 that the AEC formed an Irradiated Rebar Steering Committee. One of their first proposals to deal with situation was to buy cancer insurance for residents of the Min Sheng Villa. (One wonders when buying insurance became part of the Atomic Energy's Council's responsibility?) In mid-October the AEC finally began distributing radiation testing units to residents of potentially contaminated buildings.

Frustrated by AEC's slow maneuvering, residents of the Min Sheng Villa formed their own

Where Did it come From?

The origin of this radiation remains unclear. The problem seems to originate in a batch of iron that was produced around 1982. To date, the contaminated steel that has been identified-some still has not been traced-has all come from Jin Shan Steel Company. However, the source of the original iron is still unknown. There is speculation that the iron was imported, but this remains unproven.

What is certain, is that in the process between Jin Shan's purchase of the iron and its use as rebar and other steel products, it was not checked for radiation. Whether this was due to deliberate cover-up, negligence on the part of AEC, or sim-

"Self-Rescue Committee' to represent them in dealing with the government. They finally forced the AEC to agree to provide medical examinations for the residents of the villa. However, the long term problem—what to do about the building itself—is still not solved. No agency is willing to put forth the money to reconstruct the building.

The AEC Complicity

The most frightening aspect of the case is the fact that the AEC was aware of the high radiation levels in the Min Sheng Villa as early as 1986, but chose to disregard the problem. At the time, a dental clinic operating in the Min Sheng Villa reported extremely high levels of radiation even when their machines were turned off. After investigating, the AEC suggested that the dental clinic lead-plate the walls, and then closed the case.

The Spreading Fear

The response of the people to the news has been to demand radiation testing in their own homes and offices. As more such cases are discovered, this fear is bound to grow. Geiger Counters may become the hottest selling product on the island. The Taiwanese public is for the first time, becoming aware of the need for strict regulation and better enforcement of nuclear safety standards.

Taiwan's "haunted houses" represent something far deeper than the ten individual cases found so far. They are a symbol of a dangerous source of energy mishandled in a small island country where nuclear accidents can cause disaster to millions of people. For the people of Taiwan, the only solace lies in the knowledge that the incidents have helped in creating public awareness regarding the dangers of nuclear power.

Nuclear Report from Taiwan

Nuclear Lobby Returns to Power in Russia

Fire broke out at the Chernobyl nuclear power station, but officials said that there had been no increase in radiation. Ukrainian news agency quoted an official at the station, as saying that the fire broke out in a room housing technical equipment between the station's first and second reactors. This has nothing to do with the nuclear process," Viktor Borisenko, technical shift foreman told the agency. There was no change in radiation levels. There was no violation of safety norms. No one was injured."

The Russian government has approved a massive programme of nuclear power plant construction ending a moratorium inspired by the 1986 Chernobyl disaster which sent radioactivity spewing across Europe, according to documents ' and interviews.

The ambitious building plan which would add at least 30 new nuclear power stations and double the nation's nuclear energy capacity by 2010 AD is likely to heighten alarm in Europe already concerned about safety standards in the former Soviet Union's atomic industry.

The plan was approved without publicity at a December 24, 1992 cabinet meeting despite objections from President Boris Yeltsin's ecology advisor Alexei Yablokov who called it "unacceptable from the legal, ecological, economic and political points of view."

The programme is designed to guarantee energy supplies as Russia's oil industry falters and its economy becomes ever more dependent on revenues from oil and gas exports. Critics here said it also reflects the resurgence of the atomic industry powerful and well-funded in Soviet days and the weakness of Russia's fledgling environmental movement.

At least one of the new plants would be of a design similar to the Chernobyl plant that exploded in 1986 bringing death

Next Door in Finland

The Finnish Parliament passed by 96 votes to 78 an amendment to the bill setting out government's energy policy. The amendment stated that nuclear power should not be part of Finland's energy strategy. The government had hoped for a favourable legislative decision, after which it would have submitted for approval or rejection by parliament a decision in principle to build a new, fifth unit in Finland. In the event, the Prime Minister, Esko Aho, is reported to have told his party that the decision in principle to build a fifth unit could not now be submitted to parliament.

However, despite the clear mandate from the representatives of the people in a democracy, the country's main electricity suppliers intend to keep alive the nuclear option for baseload generation.

and illness to thousands of Ukrainians and Belarussians.

Yevgeny Reshetnikov, deputy minister for atomic energy, said the design had been improved to prevent a similar accident but western experts here maintained that the inherent dangers if a Chernobyl-type plant cannot be eliminated.

Russia's ability to implement the building programme may be limited by the disastrous state of its finances. But approval of the new programme signed into law on December 28 as one of Prime Minister Viktor Chernomyrdin's first official acts reflects Yeltsin's commitment to overcome seven years of popular opposition to nuclear power.

Environmental groups here and in the West argue that political instability, antiquated systems and economic hardship make another nuclear catastrophe uncomfortably probable.

Reshetnikov rejected criticism of his industry in an interview saying Russian power stations are as safe as those in the West and calling Yablokov a 'dilettante.' To continue a moratorium on construction, Reshetnikov said, would bring 'catastrophe' to certain regions that are especially dependent on nuclear power.

The deputy minister, a veteran of the Soviet atomic industry shrugged off the possibility that Russia's decision to spend billions on atomic energy might discourage Western countries from delivering promised aid to improve the safety of existing plants. Reshetnikov complained that in any case Europe and the United States have given little beyond promises, documents and site visits.

The approved programme calls for spending 100 billion roubles this year and every year through 1996.

The Independent

Lessons from Chernobyl

Hydro-Ecological Nuclear Power Plant Site Selection

The Chernobyl accident makes it necessary to review the way nuclear power plant sites are chosen from a hydro-ecological point of view. It is also essential to study existing emergency response and remedial measures for their adequacy, said a workshop on the hydrological impacts of nuclear power plants, held under UNESCO auspices at Paris between 23-25 September, 1992.

The fifty participants, hydrologists from Commonwealth of Independent States and other countries, called for the creation of an international co-operative research pro-gramme to study the planning, risk assessment and remedial actions in case of accidents.

Their statement pointed out that accidents at nuclear power plants, which release major quantities of radionuclides into the water cycle, can endanger the safe exploitation of water resources over large areas, far beyond national borders.

"Although it is less important than contamination through the atmosphere or through food, water contamination lasts the longest, much longer that any other form. It can last for hundreds or thousands of years in the groundwater", said Abraham Mercado, Consultant of Hydrology and Environmental quality, and one of the key speakers at the workshop.

Reports presented at the workshop made it clear that although the water contamination affecting the inhabitants around Chernobyl has been of secondary importance compared to other forms of contamination, radionuclides have moved to the shallow groundwater aquifers at a faster rate that expected. This shows that the ways radionuclides move through the unsaturated zone are not known in detail.

Under different conditions than those at Chernobyl the consequences on water might be more serious, especially if water resources are scarce or of high economic value, **the workshop** pointed out. The **worst case for** water **resources would be a** melt-through, **where the bottom** of the **reactor gives way, and** the radioactive matter is released straight down.

Groundwater, which circulates at relatively shallow depths, from tens to hundreds of metres, is very vulnerable to that kind of pollution, and can transport contamination over long distance. It is also hard to track or contain contaminated groundwater.

Three main aspects were identified by the workshop for the hydrological assessment of nuc-lear power plants: the need to protect the power plants from dangerous hydrological phenomena such as floods and mudslides, the need to have a reliable water supply for the operation of the power plant, and the assessment of a nuclear power plant's impact of water systems— through radioactive, chemical, or thermal contamination.

An ideal site for a nuclear power plant, from a water point of view, would be on solid rock, where the groundwater is very deep down, where the unsaturated zone is as impermeable as possible, and where the ground-

water flows are well known and simple.

Also, it is necessary to seek **ways to** retain contaminated **water in** case of an accident, to reduce the spread of contamination. At present there is no reliable way of doing that, nor is **there a** good method for decontaminating household water. Both these topics need further study, the workshop concluded.

Follow-up of Chernobyl

For the follow-up of the Chernobyl accident, the workshop called upon the international scientific community to support researchers working in the region by providing technical assistance and equipment.

The radioactive material released from Chernobyl continues to move about in the affected ecosystems - but we do not yet know enough about this migration to predict the effects on the waters.

The major part of the radioactive fallout on the European territory of the Commonwealth of Independent States entered the catchment area of the Pripyat, Dnieper and Desna rivers. Most of it is contaminated at a relatively **low level, but as the area is very large, the cumulative amount washing out into the rivers can be higher than that in** small **catchments that** received larger amounts of fallout.

After the accident, measures were taken to limit the spread of radionuclides into the waterways; in total 131 various constructions were put up by May 1987. River barrages were built with absorbent materials, which were intended to absorb caesium **and** shortlived radionuclides, and stop them from spreading further.

These barrages quickly silted up, causing the water level to rise and flood large areas with a high content of radioactive material in the soil. As a result, even more radioactive material washed out into the rivers.

"In addition, it turned out that absorbent material **in** the dams only soaked up a small quantity of nuclides, **and** most of them were dismantled after the spring of 1987", reported Oleg Voyrsekhovitch, of the Ukrainian Hydrometeorological Institute.

Four traps were constructed in the Pripyat river, to catch suspended radioactive particles **from the** stream of water, which **were** supposed to be deposited in the bottom.

"Unfortunately, the traps were not fine enough to catch the mobile particles, and at best only caught about ten percent of them", Voytsekhoviteh said in his presentation. In the end, natural river pools and stagnation zones accumulated far larger quantities of radioactive material than the traps.

The work of limiting the damage was hampered by the lack of sufficiently accurate methods of modeling and forecasting the state of water systems. The ways radionuclides move between soil, water, sediments, surface water and ground water are not known well enough, suited a report by the Russian National Committee for the International Hydrologieal Programme.

The workshop was arranged by UNESCO's International Hydrological Programme, the Commission of European Communities, the International Atomic Energy Agency and the United Nations Environment Programme

Nucleo Rats Quit the Fast Sinking Breeder

This news item appeared in the November/December issue of Atom which was the official journal of the U.K. Atomic Energy Agency and is now, in the era of privatization, brought out by AEA Technologies which is a major supplier of nuclear industry technologies. (Of course, the heading in the Atom was different.) The news is of special interest to us in India, since the Indian nuclear dreams are. all based on the 'success' of the breeder. The fact, that the breeder has proved to be a technological mirage in other parts of the world has yet to dissuade our blinkered nucleomules.

The British government has decided to cease at the end of this financial year its £12.87 million annual funding for R&D in support of the European Fast Reactor (EFR), a multinational development programme to commercialise fast reactor technology, effectively putting an end to fast reactor R&D in the UK.

Earlier this year the government confirmed it would not **support operation** of Prototype **Fast** Reactor (PFR) at Dounreay beyond March 1994. (PER is

now scheduled for restart early **next** year after a shutdown for repairs). The only fast reactor funding it is now prepared to countenance is a small programme of experiments related to the closure of PFR.

The UK nuclear industry was **not** prepared to accede to a government request that it become solely responsible for funding fast reactor R&D. According to Nuclear Electric: The request was made more difficult because it came a year earlier than expected, long before the EPR Phase II development work—on which the promised 1993 review of fast reactors was to be based—had been completed."

Britain's nuclear utilities, Nuclear Electric and Scottish Nu**clear, which have always seen the EFR programme as a** joint effort **between government and** industry, will **not continue** to fund design work once **the** government ceases to **fund** the supporting R&D.

EFR on hold?

With commercialisation of the fast reactor not anticipated before about 2030, neither France nor Germany are particularly anxious to press ahead with EFR at this time; although equally, neither wishes to abandon fast reactor development. In France, experience with the 1200 MW Superphoenix fast reactor has been a salutary indication of the problems that can be encountered; while the relicensing process for the reactor fol**lowing** criticisms by **the French** safety body IPSN (See *Amumukti* vol6 Nol) which has only just begun, is expected to last many months.

In Germany, where a 300 MW prototype fast reactor was built but never allowed to operate, government spending is increasingly focussed on the economic problems in the east of the country.

It is therefore considered unlikely that France or Germany would wish to carry on work towards construction of a large commercial demonstration fast reactor alone.

Atom
Nov / Dec 1992

Only Financial Ingenuity Can Now Save The Indian Nuclear Programme

The following article appeared in The Times of India on 24th of October, 1992. It presents the thinking within the nuclear establishment in times when the usual government largess has become somewhat scanty due to financial strain and there are some muted calls for 'accountability'.

hanged geopolitical equations have ruined India's chances of expending the nuclear power programme with Russian help. But the country is by no means in a hopeless position. With financial resourcefulness more than technological savvy, it can retrieve the situation.

In the footsteps of France, which recently baulked at supplying enriched uranium for the Tarapur atomic power station to a non-NPT regime, Russia is having second thoughts about its turnkey project to supply a pair of 1,000 MW reactors at Kudankulam in Tamilnadu.

The inter-governmental agreement for the Kudankulam project was signed with the erstwhile Soviet Union during President Gorbachev's visit to New Delhi in 1988. It provided for a steady supply of enriched uranium and the return of spent fuel.

What sweetened the deal for India was the soft loan of 3.2 billion roubles—worth Rs 5,000 crores then—at a 2.5 percent interest. This was to **be** repaid in 14 equal installments, starting three **years after** commissioning the plant **in 1998.** The foreign exchange **outflow - imports of** some **components worth a few** million **dollars - was minimal** since the **plant was to be re-de**signed for tougher safety standards and was to be made with Indian manpower and facilities, payable in Rupees.

The sweetener has turned sour in the economic crisis following the break-up of the Soviet Union. The Russians reportedly want to renegotiate **the** agreement to supply most components rather than a turn-key project. More important, they would like dollar repayments with higher rates of interest.

What are India's **options under the** circumstances? An **inside** source, insisting **on anonymity** states, **like Barkis, Boris may be willing, but can he fulfil the partnership? Even**

if India accedes to the Russian demands, our problems will not necessarily end.

With central authority gone, except for a large corporation like Atommach, the performance of their smaller companies, scattered across the former Soviet Union, is a big question mark.

Editor's Note: In the meanwhile President Yeltsin has come and gone and there was no mention of Koodankulam in the newspapers. Therefore, it would not be wrong to assume that both sides have given-up the project and diplomatically kept silent about it.

The alternative is to build indigenously designed pressurised heavy water reactors. The design for 500 MW units is ready for implementation. The site can also take a quartet of proven 220 MW units. The main advantage of these reactors is that the fuel, natural uranium, moderated and cooled by heavy water, would be readily available within the country.

The strategic and economic importance of such self-reliance cannot be over-emphasised, says one expert. Nor does large-scale import of atomic fuel make financial sense for a country with a balance of payments problem, he adds, particularly when it has domestic reserves of 700 billion tonnes of coal equivalent of thorium and recycled uranium. By contrast, India's coal, gas and oil reserves together add up to 152 billion tonnes of coal equivalent.

The caveat is that the extraction of all that atomic energy depends upon the how successfully the country can meet the challenge of developing the entire three stage nuclear technology, the do it yourself option. Even at the first stage of extraction of energy from natural uranium, this option places a massive financial burden on India. The investment at Kudankulam envisaged Rs 2,500 crore for two units of 220 MW or Rs 5,000 crore for two 500 MW units with a gestation period of six to seven years. At 1991-92 prices, without escalation or interest during construction, this works out to Rs 30,000 per kilowatt.

Editor's Note: It is statements like those above which reveal that the nuclear establishment in the country still does not want to give up its old habitual devious ways. Half-truths are mixed with fantasies and outright lies. Words like "strategic importance" and "self-reliance" are a much repeated mantra the moment the deal becomes sour, how come we forget them when offered a little "sweetener" in the form of a low interest easy repayment loan. Is the strategic and economic importance of self-reliance pertinent only now and was not so important while the deal was being struck? In fact, the previous chairman of the Department of Atomic Energy, Dr P.K.lyengar is on record having said in March 1992 that India wants help from the World Bank and other international financial institutions for the development of the nuclear programme.

Of course, it is only in the nucleocrats' arithmetic that Rs 5,000 crores for 1,000 megawatts works out to Rs 30,000 per kilowatt. Ordinarily it comes to Rs 50,000 per kilowatt

Originally, Kudankulam accounted for Rs 6,494 crore, out of the total planned outlay *of* Rs 14,400 crore proposed for the eighth plan. The goal was to set up a nuclear power capacity of 7,700 MW by the year 2002 AD. Even after leaving Kudankulam out, the Planning Commission, has agreed for an amount of Rs 4,119 crore. Even this sum has to be split between open market borrowings, internal resource generation,by the Nuclear Power Corporation and government equity which is barely Rs 619 crore.

At the time of setting up of the Nuclear Power Corporation, the governments commitment was for a debt to equity ratio of 1:1. The government has not been able to stick to this figure. The ratio is now as high as 4:1. This means that the Nuclear Power Corporation has to borrow four rupees from the market by floating bonds for getting one rupee from the government as equity.

Public sector unit bonds have few takers today, however, thanks to developments like the banking shares scam. And borrowings from the open market at anything between 17 to 20 percent interest is counter-productive for atomic power projects which have long gestation periods. The inhibiting factor is the high interest during construction which can jack up the total cost of the project by more than half.

Editor's Note: It is interesting to note that despite these counter-productively high interest rates and some of the longest gestation periods in the world, Indian nuclear reactors, still turn out to be, according to Dr. P.K.Iyengar, the cheapest reactors in the world. Financial ingenuity in the form of creative book-keeping has always been the hallmark of the Indian nuclear programme.

Nor is the NPC like other public sector units. Given the nature of its operations, involving strategic materia] and high tech inputs which only government has been able to sustain so far, the privatisation of atomic energy has certain in-built limitations.

One way out is to seek creative resource management like preferential equity participation (without voting rights) and the other is to involve energy strapped state governments or even private companies in a sort

of assured power supply programme in exchange for equity.

Would all these problems be resolved by signing the Nuclear Non-proliferation Treaty and accepting full-scope safeguards? Not really. The days of soft loans, especially for nuclear power, are gone, says one expert. With safeguards we could perhaps be free to go to France rather than Russia for the Kundankulam project. But we would still have to pay for the technology in addition to being dependent for enriched fuel on them.

The best option then is to build reactors using India's own natural uranium. The only countries besides Canada which have the expertise are Korea, Argentina and India,

That brings the country back to square one. Even after signing the patently discriminatory NPT — which puts the facilities of the weapons-have countries of pre-1969 vintage beyond the pale of inspection — India will still have to find the finance to pay its own home-grown technology. That is not such an insuperable task for a nation that has mastered the far more arduous technological path.

Vithal C Nadkarni
The Times of India October 24, 1992

The Militaries' War On The Environment

That humans make war on the environment is a widely used metaphor, which becomes literally true when nations make war on each other. From Vietnam to Central America and Afghanistan to the Persian Gulf, warfare has had grave ecological consequences that affect not only the environment, but the health and security of the people who depend on it. And the negative impact of the world's armies on the environment neither begins nor ends with a shooting war. Every day militaries use up non-renewable resources, pollute water sources, and contribute to ozone depletion.

Images from the Gulf War of the smoke-darkened Kuwaiti desert with oil wells burning out of control was a stark reminder of the environmental damage of war. Ongoing revelations of radioactive pollution from nuclear weapons sites in the United States and the former Soviet Union point to the costs of peacetime military activity. More recently communities are becoming aware of the environmental impacts of military bases and the numerous toxic chemicals they use. All of these revelations have helped lift the veil from the myriad of ways that militaries wage war on the environment (and all of us), even when they are not waging war on each other.

The Gulf war is vivid case study in the damage that war can cause the environment. While the hundreds of oil fires have been extinguished, oil lakes still cover the Kuwaiti desert. Oil still contaminates the Gulf and little has been done to clean the hundreds of miles of coastline. Studies to determine the full extent of the damage to important and fragile ecosystems critical to a range of animal and plant species have only begun. Heavy military vehicles and military fortifications have dug up and packed down the deserts of the region that, lacking water, will take years to recover. A year and half after the end of the war little is known about the full extent of environmental damage caused by the bombing of Iraq's nuclear and chemical weapons facilities and petrochemical and other industrial sites. The bombing of Iraq's electrical system caused widespread disruption of sewage and other critical systems polluting water supplies and spreading disease. Throughout the developing world, immigrant workers in the Persian Gulf fled home as Gulf War refugees increasing stress on rural ecosystems and urban areas.

Resource Use

Like the Gulf War, many wars are about access to resources. Michael Renner of Worldwatch Institute estimates that the world's armies use as much energy as the economy of Japan, about six percent of total use worldwide. An F-16 fighter burns more fuel in an hour than the average U.S.car does in one year. Militaries account for nine percent of the iron and steel consumed each year. They also use a large proportion of such minerals as beryllium, cobalt, and titanium. In a self-perpetuating cycle, nations create armies to gain access to resources that their armies must consume in order to function.

Militaries have a seemingly insatiable appetite for land to train on. This need has risen steadily as armies have grown larger and weapons have become more technologically advanced. Modern artillery can shoot farther. Up to one percent of land worldwide is directly used by militaries. Every year additional land is damaged or made unsuitable for civilian use. Unbearably loud noises from overflights by jets can cause health and other problems for residents and wildlife below

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training areas. In recent years protests against low-flying jets in Europe and across the United States are beginning to curb the impunity with which western air forces disturb those below.

Large tracts of land are also destroyed during war. Operation Ranch Hand sprayed 18 million gallons of herbicides on more than six million acres in Vietnam and a lesser area in Laos and Cambodia. That land is only beginning to recover. Track marks can still be seen in the deserts of North Africa, reminders of the massive tank battles of World War II.

One of the longest lived legacies from many wars is the thousands of rounds of unexploded bombs and mines left over from many wars. These bombs can maim and kill and unless thoroughly cleared they make use of the land dangerous for decades. German mustard gas shells, lobbed during World War I, are still occasionally uncovered. Unexploded ordnance is still a major problem in Vietnam, sending numerous children and farmers to the hospital 17 years after the war. Mine clearing is a big and dangerous business now, with companies vying for contracts to remove mines in Angola, Kuwait, and Cambodia.

Toxic Chemicals and Hazardous Waste

While negotiations on a treaty to ban the possession of chemical weapons recently ended, militaries wage chemical warfare daily on their own citizens by using some of the most lethal chemicals known—not to wage war but to prepare for it. Solvents, PCBs, pesticides, heavy metals, alkalies, propellants and explosives then need to be disposed of safely. According to Pentagon's Defense Environmental Restoration Programme, 17,482 toxic hot spots have been found at the 1,855 domestic installations. (The U.S. does not provide figures for its overseas military bases.) A toxic hot spot is a place where hazardous waste contamination poses a potential threat. Areas around many conventional and nuclear production facilities are also contaminated. The costs of cleaning up these sites are astronomical and estimates vary widely, anywhere from $50 billion to $200 billion.

As a number of militaries begin post-Cold War reductions,

Missile Testing range coming up in Hunsur taluk

The defence ministry has decided to establish a "missile- testing range" in Kuppekollagatta area of Hunsur taluk about 82 km from Mysore and construction work at the site is in full swing under the supervision of the army engineers.

The army has acquired about 5,800 acres of land belonging to the revenue and forest departments and initiated measures for aquisition of 925 acres of agricultural land belonging to farmers of Hosaramanahalli village in Hunsur taluk. Even the state government has appointed a special land acquisition officer for the task.

The Kuppekollagatta area — a hilly terrain selected for the purpose, is situated on the left side of the Mysore-Mangalore state highway. The authorities have kept the news of the missile testing range a closely guarded secret. Informstion gathered from various sources indicates that the construction work will take about 2 years. Even before the completion of the land acquisition process, the military authourites have started construction of compound wall of the range and a Hyderabad-based construction company has been given the contract.

The range was earler proposed in Bijapur district, but strong opposition from the public forced the defence ministry to shift the range from there to Mysore district. This was one of the reasons why the authorities have kept the establishment of the range such a secret ," according to an official. Even the Assitstant Commissioner of Hunsur, M.Kumara Naik said that he was unaware of what exactly was proposed. There is a proposal for the establishment of some kind of a defense project but 1 don't know the details," he said,

The news of the establishment of the range seems to have bewildered villagers of the surrounding villages. Particularly worried are the residents of Hosaramanahalli, who arc losing all their land for this development project. As the name of the village suggests, they had originally belonged to Ramanahalli village which was submerged in the waters of the Krishnaraj Sagnr Dam. Mr Linga Naik, an eighty year old farmer, related the story of how it had required years of efforts before the government had allotted land in compensation for the land they had lost in submergence.

Meanwhile, activists of the Karnataka Vimochana Ranga who have come to know of the project, were trying to educate the people about the I-effects of the project and mobilise the people against it. Mr Puttaswamy, an activist said the unicn government was converting Mysore into an 3rsenal. "First came the uranium enrichment plant at Rathnahalli, now the missile testing rane and what is more in store for Mysoreans is not known,' he exclaimed

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the need to isolate and clean up chemical pollutants will delay alternative uses at many military bases. Also delayed will be the economic recovery of communities around the bases open or conduct shoddy clean ups.

> Contamination of U.S. nuclear weapons facilities alone may cost $200-$300 billion to clean up

There is every reason to believe that contamination at the bases of other militaries is as bad or worse. Germany recently put former Soviet soldiers awaiting repatriation to Russia to work locating dumps created in East Germany. No oversight from host governments and poor record-keeping or a lack of any records mean that an unknown number of toxic time bombs are scattered throughout eastern Europe.

The disposal of chemical weapons poses a number of special environmental hazards. After World War II, stocks of chemical weapons were haphazardly dumped in several ocean areas. Now the U.S. and Russia have adopted incineration as the preferred disposal method, ignoring and inadequately researching safer alternatives. The U.S. moved chemical weapons from Okinawa and Germany to Johnston Island in the Pacific in 1972 and 1990. Pacific Islanders now fear that the U.S. will incinerate its entire stockpile of chemical weapons at Johnston, ignoring their wishes and well-being.

Nuclear Contamination

Toxic and nuclear contamination from nuclear weapons production and testing have created life-threatening conditions in many parts of the world. Nuclear tests have spread deadly radioactive isotopes world-wide. Contamination from test sites, military nuclear reactors, warhead assembly plants, and haphazardly created waste sites is migrating into water supplies and the air, threatening the communities and ecosystems around them. Safe ways to clean up and dispose of millions of tons of radioactive waste produced by uranium mining, weapons production, and now, the dismantling of nuclear warheads remain elusive. Contamination of U.S. nuclear weapons facilities alone may cost $200-$300 billion to clean up over the next 30 years. Nuclear hot spots in the South Pacific, U.S., former USSR, China and elsewhere will threaten the health of many for years to come.

Indigenous people have especially suffered from the nuclear arms race. Their lands and waters in North America, the Pacific, North Africa, former USSR, Australia, and elsewhere have been irradiated by nuclear tests by the major nuclear powers. It is still not safe for Marshall Islanders to remhabit their original islands. In Australia, the aborigines received little or no warning before the British tests contaminated them in the 1950s.

Above ground nuclear testing contaminated the atmosphere, but many underground nuclear test leak radiation as well. Other military activities are affecting the atmosphere as well. The military is responsible for over two-thirds of U.S. use of the ozone depleting chemical CFC-113. While the Pentagon is moving away from CFC use, the high cost of changing military specifications is stalling the conversion to safer chemicals in the U.S. and abroad. Because many other nations follow the U.S. lead when it comes to technical requirements in weapons production. Exhausts from solid fueled rockets and missiles inject large amounts of ozone harming hydrochloric acid directly into the upper atmosphere.

National Security

Militaries citing "National Security have hidden their environmental crimes behind a veil of secrecy. In many nations, the military is often exempt from environmental rules and regulations either by law or by custom. In recent years, Congress and grassroots protest have increasingly brought military activities under environmental laws and regulations that apply to others, but the Pentagon and the Department of Energy continue to resist efforts to treat them like any other polluter. And most environmental laws contain loopholes that allow the President to cite a national emergency to exempt the military.

> The military is responsible for over two-thirds of U.S. use of the ozone depleting chemical CFC-113.

The military harm to the environment is not confined to its direct impacts. Hundreds of billions of dollars worldwide are spent preparing for war. Military spending continues to consume monetary, human and other resources short-changing environmental protection, development and other social needs. Billions more must now be spent on cleaning up military messes.

Many politically involved militaries protect, promote, and often directly benefit from environmentally destructive projects and activities. They are used to suppress opposition to harmful projects , stifling any environmental debate. The wholesale destruction of the Amazon began under the military dictatorship in Brazil. Burma's military is cutting down its teak forests, trading the wood for arms and cash to support its dictatorship. In the name of anti-communism, the Philippine army suppressed dissent against environmentally, de-

structive forestry, hydroelectric and other projects during and after the Marcos regime.

New Image

Many of the world's militaries, seeing which way the public opinion winds are blowing, are working to improve their environmental practice and image. In the United States, the Pentagon regularly proclaims this or that environmental innovation. Several years ago, the Senate passed the Strategic Environmental Initiative: the proposal to fund the military to release environmental data and do environmentally useful work. But the military mindset on this matter was revealed when, after a long delay, the Pentagon proposed the first project under SEI find a more environmentally benign way to produce plutonium triggers for nuclear weapons.

At Pentagon conferences during the build up toward the Gulf War, Secretary of Defense Richard Cheney put best face on military environmental practice, admitting the need to remedy past mistakes and championing efforts to recycle, substitute non-toxic materials for harmful ones, and preserve nature on military bases. But Admiral David Jeremiah, vice chair of e Joint Chiefs of Staff, made clear that there are limits to how gently armies can adapt to the environment. When forced to choose, the military's mission comes before environmental protection. War and preparation for war are "always inherently destructive and inefficient," he said.

A major international opportunity to deal with impacts of the military on the environment was lost last spring when the UN Conference on the Environment and Development (UNCED) sidestepped these problems. The US delegation worked hard to keep military matters off the agenda and proposals holding nations accountable for how their militaries handle their hazardous waste and contaminate the environment with their weapons of mass destruction were watered down or deleted

Many things can be l done to alleviate some of the most environmentally harmful practices of militaries measures that must be taken as steps toward disarmament regardless of whether bases remain open or are closed. But in the end militaries will have to be eliminated to finally bring an end to their war on nature and on us.

John Miller
Nonviolent Activist Nov./Dec. 1992

Wall Street Blues

In March, 1992, Lehman Brothers, the Wall Street investment house, held a half-day conference titled "Are Older Nuclear Plants Still Economic?" Last week an Oregon utility announced plans to shut a plant that is just 16 years old, the third such retirement announcement in U.S. this year. Paul C. Parshkey, the organizer of the March conference, said that perhaps he had misnamed his event. The question is not whether the older reactors are economically sensible to operate, he said, but whether any are?

When is a reactor old? If Trojan, the Rainier, Orepm, plant, is indeed closed in 1996, it would be only halfway through its anticipated 40-years life span. Reactors seem to age on some accelerated calender. Trojan's steam generator is deteriorating. Steam generators, which transfer heat energy out of the reactor, are common to one type of plant, but each design has a characteristic weak spot that grows worse with age?.

The nuclear industry was well on its way to extinction, even before the announcement by Portland General Electric, which owns and operates Trojan Nuclear Power Plant. There are few replacements in sight for Trojan and 109 other commercial operating plants in the U.S.

> **"The question Is not whether the older reactors are economically sensible to operate, but whether any are?"**

Throwing in the towel on a plant like Trojan is a painful decision. In the era of "not in my backyard", it means giving up operating permits that will be hard to replace And running it longer would give more time to accumulate money for tearing it down and disposing of nuclear wastes; so far there is $25 million in the company's piggy bank against a cost it has estimated to be at anywhere from $200 million to nearly $500 million.

But the world has turned nasty for Trojan, in ways the builders never expected. When Trojan entered service, Congress made it illegal to build new gas- fired power plants, be cause the accepted theory was that North America was running out of gas. Now Canadian gas supplies glut the West Cost,

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making gas a cheaper power source than a wheezing reactor.

And in the early years of Trojan's life, demand for power was galloping ahead by as much as 7 per cent a year. But today, a refrigerator bought at an appliance store uses half the electricity of an average model bought when Trojan was new.

Those factors affect many plants, but not all are threatened. "You're looking at a universe of 110 reactors", said Carl Goldstein, a spokesman for, the nuclear industry's public relations arm. "It doesn't seem startling to me that you have some defection". Trojan, he said, faced politically stiffer opposition than most plants. It survived statewide referendums in 1986 and 1990; another is due this November. It was in a region with so much hydroelectricity that it was not needed year-round, a disadvantage for a capital-intensive technology.

Political Challenges

Some detrimental factors can change, said Mr. Goldstein. The price of gas will rise someday, and the Clean Air Act will make coal, which is the main source of electricity, more expensive.

And some reactors may be able to run much longer. Those that are well-maintained could continue for a long time, said Mr. Parshley, the Lehman Brothers executive who organized the March conference. But their overall durability will only be proven plant by plant. Last year the Nuclear Regulatory Commission approved a procedure for utilities to apply for 20-years extensions to their plants 40-year licenses. The plant that was widely expected to apply first, however, Yankee Rowe in Rowe, Massachusetts quit at age 32 earlier this year.

Not every piece of machinery wears out early. "You have children of B-52 pilots flying B-52's now", Mr.Parshley said.

Utilities and regulations are scrutinizing the alternatives to reactors more closely. A company might choose to spend $50 million on subsidies to customers who replace their old, inefficient refrigerators and air conditioners, because that will do more to solve the power problem than spending the money on building, fueling and staffing a new plant. Or the company might find it cheaper to buy power from independent generators. Two days after its Trojan an-

Subscription Information

Rs. 25/- per year (6 Issues) for South Asia
U.S. $ 15/- per year or equivalent In other currencies for airmail overseas.

Rs. 250/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/- as clearance charges.

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Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampoorna Kranti Vldyalaya
Vedchhi, District: Surat, 394 641
India

Please do not send cheques or drafts addressed to Surendra Gadekar
Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed at The Prijat Printry, Ahemedabad
PRINTED MATTER

BOOK POST

nouncement, Portland General Electric said that it would put money in windmills.

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume) 6 Number 4 February/March 1993

The Rehabilitation Grinder

Once upon a time, the Satpura mountains and ____ the Tapti valley which originates from these mountains were both covered with thick forests. Nowadays, one is lucky to see maybe a tree or two out here to remind one of the glory gone by. Of course, there are clumps of Eucalyptus trees from various "social forestry" schemes. Villages dot the farms in the river valley looking like raisins in a cake.

The Gandhi Mela, which is observed every year jointly in the three districts of south Gujarat was held this year at a small village called Khorda in Nizhar Taluka of Surat district We had gone there on cycles with communal harmony as our theme. While returning, friends invited us to take a round about route and visit their homes. "It would get you in this area which is downwind from the Kakrapar Nuclear power plant The road goes through some beautiful countryside. And you can tee some of the only bits of jungles left in Gujarat." After such an invitation it was impossible for us to refuse.

Twenty years ago, a dam was built across Tapti at Ukai. The displaced people were "rehabilitated" on both banks of the river. In the old days before independence, this area belonged to the kingdom of Rajpipla. The raja had invited farmers to come and "settle the land." A number of rich absentee landlords from the coastal region of south Gujarat had accepted this invitation, levelled the land and got it 'farmed' by "halpatia"—poor farmers. After about half a century of this farming, the land is no longer very productive. Thus, these landlords are today happy to sell the land to the government for rehabilitation. It gives them adequate money as well as prestige. They are 'helping' to build the lifeline' of Gujarat

While the immediate neighbourhood is today totally devoid of forests, there are old growth forests still extant some 15 to 20 km distant They give a fleeting idea of what the area must have looked like in the old days. Today the whole area is a giant refugee colony. Here are the old resettlements of Ukai. There the Karjan dam resettlements. And all this area is reserved for the new colonies of the Narmads displaced. All the different 'project affected persons' have received different amounts of 'compensation'. This has resulted in some jealousy. The Karjan people are envious of the Ukai lot, while the Ukai people are jealous of the Sardar Sarovar refugees.

Ummarda village is a twenty year old settlement of refugees from Ukai. An Ashram school and a post-basic school are being run in this village by the Ukai Navanirman Samtti. Some time back, a number of 'Ambar Charkhas' were running in the village as part of rehabilitation and employment generation activity; right now this activity is almost dead. At least one person from each house has to go to Surat or Ankaleshwar in search of employment as a daily wage earner. People feel cheated and there is widespread dissatisfaction at the amount of compensation. They also strongly regret the loss of their culture and the sense of community that they had in the jungles.

There are some six or seven settlements of the Narmada refugees around Ummarda. Some are as old as three years while some had people who had just arrived a fortnight back. More are coming.

Nani Bedwan is an old village. This was settled during the time of the raja. There are some non-adivasi trader families settled here from as far away as Rajasthan, M.P. and Maharashtra. Two years ago during communal tension in this area, adivasis from outside the village came and burnt some shops and beat up some people. Twenty Muslim families fled the village during that time.

Just outside Nani Bedwan is one 'new' settlement of Narmada displaced. There are three tin sheds and a hand-pump which was not working. Some 15 to 20 families have come here very recently. There isn't a green tree nearby. There are some empty cotton fields. During daytime even in the month of February, it is terribly warm inside the sheds. Everybody is sweating. Some women bring a few pitchers of water. They point to a village a kilometer away when asked about the source of the water. Outside the tin sheds are some old bamboo, some wood and roofing material still lying around. Children are playing in the midst of all this. There is very little space left after two cots are put in the shed.

"Who likes to give up their father's land and come and resettle so far away from home? First, we were fighting for land and jungles. Medha Patkar Bai is from Maharashtra. That is why the Maharashtra people say "*Koi nahi hatega, bandh nahi banega*" But we are Gujaratis. That is why we are with Ambrish Bhai and Tripti Behn. They are Gujaratis and very decent people. After all we have to go with someone amongst the sahebs. Today, every one of us has got five acres of land each. Although children of 18 years of age have still not got their five acres. An enquiry is being conducted to find out the ages of the children. Nobody has got the money for making the house. Those who came earlier, they received money for constructing houses. Each family had got fifteen hundred rupees. But we haven't got any. Our neighbours are thieves. Just last night they had come to steal our wood. It was lucky that we got up and made a noise and they ran away. We used to live in the jungles. Our village was Surpana near the river. There we had water and wood and food and medicines all from the jungles. Here, you see for yourself. There is not a tree in sight Where will we get.the firewood for cooking our food?"

"Who likes to give up their father's land and come and resettle so far away from home? We used to live in the jungles. There we had water and wood and food and medicines, all from the jungles. Here, you see for yourself. There is not a tree in sight. Where will we get the firewood for cooking our food?"

"There we were working as farmers. When there was no work in the fields, we would work as labourers breaking stones. Here there is no work. There all of us used to work and we would earn enough to last out till the rains. We have come here out of helplessness. It is better to come now while we are still getting land rather be forced later and not get anything. Over there we used to farm seven acres of revenue land and five acres of forest land. All those who had more land, they have lost. If we work we will eat. There also we used to eat on our labour. Here too if God is merciful, he would give us the strength to labour. The land of our forefathers, irrigation facilities, all this sister is not written for us poor. The irrigation from Narmada is for those rich farmers who live downriver. It is not for us. What we have got is better than getting our houses drowned in water and loosing whatever little we have."

The Gujarat Government keeps telling us that the Sardar Sarovar resettlement is the best that there is. And then doesn't somebody have to pay the price of development? When Ukai dam was built, this area of south Gujarat became sugarcane country. Did we not all prosper because we were able to grow such things like sugarcane and groundnuts? So what if the adivasis of Uchhal and Nizhar had to loose their lands and are now reduced to a helpless state looking for employment as sugarcane cutters? If one person dies and two others can live comfortable lives then is it not better for the weak to die? Even the World Bank will tell you that the cost-benefit analysis shows that the ratio is better than 1.5. And after all these people are only adivasis. We have made a tin shed, haven't we? Given each of them five five acres of land. Even put up a hand-pump. So what if it doesn't work. These people from the jungles, what more can they expect?

When will we ever wake up from our comfortable sleep?

Sanghomtira Gadekar

Profiting From Cancer

Vested Interests and the Cancer Epidemic

For years, the medical establishment in Europe and North America, in concert with industrial interests and academic representatives, has misled and confused the public by repeated claims that it is "winning the war against cancer." But despite the vast sums of money poured into cancer research, the incidence of cancers (standardized for age) has escalated to epidemic proportions, while the ability to treat and cure most cancers has hardly improved. Moreover, there has been a concerted effort to downplay the environmental and occupational causes of cancer; by highlighting almost exclusively the role of smoking and diet, an attempt has been made to shift the blame from industrial polluters to individual cancer victims who "have only themselves to blame".

In 1990, over one million US Americans were diagnosed as having cancer, and a half a million died of the disease. Cancer now strikes one in three people and kills one in four in the US, UK and most other western industrialised countries. This compares with an incidence of one in four in the 1950s, when the mortality rate was one in five.

Since the 1950s, age-standardised cancer incidence rates in the US have increased by 43.5 per cent overall, the rates for some common cancers rocketing. Between 1950 and 1988, lung cancer increased by 263 per cent, prostate cancer by 100 per cent, and female breast and male colon cancers by about 60 per cent Rates for some less common cancers have also risen sharply: malignant melanoma (skin cancer), multiple myeloma (bone marrow cancer), and non-Hodgkin's lymphoma (cancer of the lymph glands), have increased by well over 100 per cent, while cancer of the testes and kidneys in males have doubled. Similar increases have occurred in industrialised countries besides the U.S. The only major declines have been for stomach and cervical cancers.

From 1975-1984, overall age-standardised mortality rates increased by 5.5 per cent — from 162 per 100,000 to 171 per 1000,000. Such national averages, however, obscure significantly higher cancer mortality rates within certain groups: the death rate among those over 75 years, for example, increased by 9 per cent from 1212 per 100,000 to 1351 per 100,000.

Some 75 per cent of all cancer develop in those over the age of 55. But there are notable exception, particularly some leukaemias, brain cancers and cancers of the testes, which strike mainly the young and have been increasing at alarming rates. For instance, the increase in testicular cancer among men aged between 25 and 34 has increased 300 per cent since the Second World War. Cancer rates are particularly high among the low income groups: blacks (with an incidence approximately 10 per cent higher than whites): those living near industrial plants, mines, chemical works and nuclear installations; and workers exposed to chemical and radioactive carcinogens. The rates for certain cancers are ten times higher among some industrial workers than within the general population. In addition, rates in children of workers who handle chemical carcinogens have increased sharply: the risks of childhood leukaemia are two to five times higher if there is parental exposure to spray paints, dyes or pigments during pregnancy.

Smoking as Scapegoat

Yet, contrary to their own data, both the National Cancer Institute (NCI) and the American Cancer Socioty (ACS) have insisted - until very recently - that the incidence and mortality rates of all cancers other than those related to tobacco, are not increasing: "We are not certainly experiencing an overall epidemic of cancer, except for that attributable to cigarette smoking." Similar unfounded assertions have been made by British epidemiologists such as Richard Doll who earlier this year, contrary to documented evidence, alleged that the increase in mortality from cancer "can be accounted for in all industrialised countries by the spread of cigarette smoking." Yet, as a recent study points out:

> *'In the USA and UK, mortality rate* for lung cancer... have actually begun to decline in men, due in large part to reductions in smoking. Moreover, despite these reductions in lung cancer, incidence and mortality for many other types of cancer increased from 1969 to 1986 in 16 industrialised countries, especially in persons over age 66. The causes of these recent increases in cancer cannot simply be explained by smoking, but appear to reflect other exposures to*

changing factors in the environment.

Static Cure Rates

Highly misleading claims have also been made by the cancer establishment with regard to improving 'cure' rates for cancers (conventionally defined in terms of the number of people who survive for five years after diagnosis). In particular, the efficacy of the latest anti-cancer treatments - from cytotoxic chemotherapy to interferons and biotechnology products, such as tumour necrosis factor, monoclonal- antibodies and interleukins - have been grossly overstated.

According to NCI's own statistics, overall five-year survival rates from cancers in all ages and races improved marginally from 49.1 per cent to 51.1 per cent from 1974 to 1987 - the rates for blacks during this period actually dropped from 38.6 to 38.4 per cent Even this minuscule improvement in overall "cure" may be little more than a statistical artifact: earlier diagnosis, for example, may extend the period between diagnosis and death, leading to the conclusion that the patient has survived longer, when the cancer may have proved fatal regardless of when it was diagnosed. The rates ignore the many patients who are judged "cured", but die from the recurrence of the same cancer after they have passed the five year period. This is particularly true for women with breast cancer.

Not surprisingly, the claims made by organisations such as the NCI and the ACS for advances in the ability to treat and cure cancer are meeting increasing scepticism. Five years ago, the US General Accounting Office stated:

"For the majority of the cancers we examined, the actual improvements (in survival) have been overestimated by the published rates... NCI does not systematically alert readers of its annual statistics reviews to potential sources of bias that affect changes in survival rates. It is difficult to find that there has been much progress...(For breast cancer), there was a slight improvement... (which) is considerably less than reported."

More recently, in 1990, a leading biometrician concluded after a comprehensive review of the literature and a questionnaire survey of over 250 cancer specialists (oncologists) and research units worldwide that the benefits of chemotherapy for treating most epithelial cancers have, with the possible exception of the rare "small-cell" lung cancer, been greatly exaggerated.

> **"Many oncologists take it for granted that response to therapy prolongs survival, an opinion which is based on a fallacy and which is not supported by clinical studies".**

Causing Breast Cancer

To make matters worse, many of the "cures" and putative "prevention" programmes promoted by the NCI and American Cancer Society may actually be causing cancer. Over the last two decades, for example, more than $1 billion has been spent on "combating"breast cancer. According to a 1991 report by the General Office of Accounting, however, "there has been no progress in preventing the disease."

NCI programmes insist that the major cause of breast cancer is a high fat diet, ignoring the considerable evidence of the role of avoidable carcinogenic dietary contaminants. These include pesticides, such as DDT chlordone and dieldrin which concentrate in animal fats, and exogenous oestrogens in animal fat, due to the unregulated use of growth-promoting hormones as additives in animal feed.

Apart from adhering to such myopic science, the NCI and ACS have failed to investigate the carcinogenic hazards of mammography, particularly the relation between recently increasing breast cancer rates and high-dose X-ray mammograms administered to some 300,000 women during the 1970s as part of the Breast Cancer Detection and Demonstration Programme. Based on a wide range of previously published epidemiological data, a group of international radiation specialists estimated in 1972 that breast cancer risks would be increased by approximately one per cent for every rad of exposure. Thus, a premenopausal woman having one mammogram a year for 10 years, with a conservative estimated dose of two rads per exposure, would have a 20 per cent excess risk of contracting breast cancer. A confidential memo by the senior NCI doctor in charge of screening programme may explain why women were not alerted to this risk, in spite of warnings by the US National Academy of Sciences and by the NCI's own key scientific staff. The memo, which may also account for the cancer establishment's enthusiasm for the BCDDP programme stated;

"Both the ACS and NCI will gain a great deal of favourable publicity because they are bringing research findings to the public and applying them. This will assist in obtaining more research funds for basic research and clinical research."

The NCI has now embarked on a "prevention" trial which can only be described as a prospective experiment in carcinogenesis. Some 16,000 healthy women - deemed to be at increased risk of breast cancer for

familial and other reasons, including just being aged over 60 - are to be given tamoxifen, a drug which it structurally related to the synthetic growth-promoting hormone DES. Manufactured by the giant British pharmaceutical company Imperial Chemical Industries (ICI), tamoxifen not only binds very tightly to DNA, —a general characteristic of carcinogens— making it "a poor choice for the chronic preventive treatment of breast cancer" - but has also been described as "a rip- roaring liver carcinogen." This experimental evidence of potent carcinogenicity is confirmed by two case reports of liver cancer among 931 women receiving 40 milligram doses of tamoxifen for treatment of breast cancer.

Conflicts of Interest

Cancer care is big business; annual cancer drug sales in the US total approximately $1 billion. Underlying the NCI's fixation with diagnosis, treatment and research into new drugs and other "cures" is an institutionalised alliance between interlocking professional and financial interests; the highly profitable pharmaceutical industry is at its hub.

Core members of this alliance - the "cancer establishment" - include:

- The National Cancer Institute and the powerful "philanthropic" American Cancer Society.
- The major US "cancer centers" , notably New York's Memorial Sloan-Kettering cancer hospital, whose annual budget exceeds $350 million, and Boston's Dana-Parber Cancer Institute;
- University departments and staff under contract to the NCI and the ACS or receiving grants from them;

. Major pharmaceutical corn- Multiple connections between this cancer establishment and chemical, pharmaceutical and biotechnology companies have spawned "the drug-development industrial complex". Furthermore, a "revolving door" operates between the NCI, the major cancer centers and the drug companies. For example, Stephen Carter, head of drug research and development at Bristol-Myers Squibb, is a former director of NCI's Division of Cancer Treatment

A still more obvious conflict of interest relates to the three- member executive Cancer Panel which controls NCI priorities and policies. The panel is appointed by the US President under the terms of the 1971 National Cancer Act Of its past chairs, the longest serving was Benno Schmidt, an investment banker, senior drug company executive, and member of the Board of Overseers of the Memorial Sloan-Kettering. He was followed by the late Armand Hammer, chair of Occidental Petroleum, the company responsible for Love Canal and numerous other pollution disasters, and a major manufacturer of carcinogenic chemicals.

Such conflicts of interest explains to a large extent why treatment, not prevention, has been and still is the cancer establishment's overwhelming priority. Of a $2 billion budget in 1992, NCI claims to have allocated about $646 million or 30 per cent to "cancer prevention". Included in the "cancer prevention" budget was allocation of some $335 million • 17 per cent of the total budget • for "primary cancer prevention". But only minimal funding - $60 million at most - has apparently been awarded for research and interventions into avoidable carcinogens in air, water, food, home and the workplace (with the exception of wide-ranging smoking prevention programmes); only one per cent of the overall $2 billion budget is earmarked for research into occupational cancer. No significant funding seems to have been given for efforts to reduce such avoidable exposures.

Cancer, Life style and the Environment

NCI reluctance to address the issue of environmental carcinogens typifies its "blame the victim" approach to the causes of cancer. In this simplistic and sometimes self-interested view, personal habits and lifestyle, not industrial interests, are held responsible for cancer: prevention concentrates on anti smoking campaigns, for example, rather that curbing more general pollution in the workplace and the environment.

The NCI's estimates of the causes of cancer are largely based of an obsolete analysis of trends in cancer mortality from 1933- 1977. Even when it was first published in 1981, the analysis was criticised severely by leading independent US authorities for its misleading statements on the causes of some, if not most, cancers and for its preoccupation with blaming the victims for faulty lifestyles, while trivialising or ignoring *the* role of avoidable exposure to industrial carcinogens. The report concluded, for example, that "there is no evidence of any generalised increase in cancer mortality other than that due to tobacco." This conclusion was reached by excluding from the study consideration of blacks (because of the alleged unreliability of the statistics) and people over the age of 66 • the very groups in which more than half of all cancer deaths have been reported - and by incorrectly ascribing lung cancer almost exclusively to smoking. The study was also devoid of any cited quantitative scientific

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data, apart from that for smoking, for which the confounding variable of occupational exposures was completely ignored.

According to Doll and Peto of the Cancer Establishment, diet causes 35-70 per cent of cancers and smoking 30 per cent. Other causes, such as alcohol and sunlight, brought the total up to 96 per cent, leaving a balance of 4 per cent to occupational causes, This tenuous hypothesis flies in the face of evidence:

- Over the last decade, a plethora of new studies have identified numerous products and processes as carcinogenic, including cancers in a wide range of organs, notably the brain, bladder, kidneys and bone marrow.

- Based on exposure data, the US National Institute of Occupational Safety and Health (NIOSH) has estimated that approximately 11 million workers are exposed to occupational carcinogens.

- In late 1981, Peto backtracked and admitted that, "Occupational factors are likely to account for...a large percentage eg. 20-40 per cent of all US cancer. Even low estimates represent large enough absolute numbers of deaths to justify both intensive research and political action... A mere 2.5 per cent of all US cancer deaths would represent some 10,000 deaths per year."

- Of 37,000 cancer deaths each year in New York state, an estimated 10 per cent are due to occupational exposures. The same percentage applied to the US as a whole gives an annual mortality rate of 50,000.

By the year 2030, it is estimated that asbestos - the single most important known occupational carcinogen - will have caused some 300,000 cancer and other deaths, including 60,000 non smoking related mesotheliomas (cancer of the chest of abdominal linings). Such assertions negate the continuing assertions by Doll, on whom the NCI still unaccountably relies, that asbestos is responsible for only a "few cases of mesothelioma"

- Over 20 US and international studies have identified parental exposure to occupational carcinogens as a major cause of which has increased by 21 per cent since 1950.

Reforming the NCI

The complex web of vested interests described above limits the feasibility of implementing the long overdue reforms of the NCI. However, pressure for reform is growing. A statement criticizing federal cancer policies, released in February 1992, was signed by 68 prominent experts in the fields of industrial medicine, carcinogenesis, and public health. Similar criticisms need to be levelled at the cancer establishments of other countries.

Prof. Samuel J Epstein
The Ecologist Sept I Oct 1992

This is an edited version of an address given by Professor Epstein at the May 1992 meeting of the National Cancer Advisory Board. A complete referenced version is available with The Ecologist. We have included this in Anumukti since radiation is one of the most potent carcinogens, and also because the cancer establishment in India is no better. Famous oncologists have lent themselves to spreading disinformation regarding effects of radiation and the tuberculosis detection programme could be leading us to a position where like mammography we would be creating a cancer epidemic in the future.

The Brotherhood

The following table was published in the AERB Newsletter; the official organ of the Atomic Energy Regulatory Board.

Cancer Risk Factors in Dally Life

Diet	33%
Tobacco	31%
Viral Infection	10%
Sexual	7%
Alcohol	4%
Industrial Occupation	4%
Hereditary	2%
Environmental Pollution	2%
Environmental & Medical Radiation	1%
Additives	1%
Unknown	5%

Based on E.H.Rosenbaum's "Can you prevent Cancer".

"In advanced countries the dose due to medical procedures are generally high unlike developing countries. Even in these countries background and medical radiation together possibly causes just one cancer out of every 100 cancers."

The above is a fine example of the "brotherhood"—the network of interest groups. Thus, we have the cancer establishment, basically saying that cancer is your own fault due to wrong diet, smoking, alcohol, sex, heredity, what have you, and the nuclear regulatory establishment— whose stated purpose is to protect the public from "unnecessary" exposure— then using these "findings of experts" in trying to imply that pollution general and certainly radiation are n cause for worrv.

The Turkish Turmoil

Even as early at 1987, the health consequences of the Chernobyl disaster were apparent in Western Turkey, according to the German Magazine *Psychologic Heute.* This was the area which was most affected by the radioactive fallout from the accident There were large number of babies born during that time with deformities, especially to mothers who were in their second month of pregnancy when the accident occurred. The most dramatic was the case of the village of Diizce, on the western coast of the Black Sea, where, in November 1986, ten babies were born with their brains outside of their skulls—an extremely uncommon condition. Recent reports indicate that the number of abnormal births has quadrupled in the city of Trabzon, since 1986.

A press report dated 13 March 1992 from the semi-official Turkish press agency "Anatolia" states that the Turkish Government is planning to bury 14,000 tons of radioactively contaminated tea. The report adds that 44,000 tons of tea have already been buried by the authorities.

However, at the time of the accident, the Turkish government was engaged in a programme of massive disinformation. A month after the accident the minister for industry, referring to people who pointed out the dangers of radioactive contamination, called them "godless persons". "A little radioactivity is good for the body," he said. The then Prime Minister (and the present President) Turgut Ozal, claimed that radioactivity was good for male virility. And both the politicians got themselves photographed drinking the supposedly contaminated tea in a propaganda bid to show how 'harmless' it actually was.

The government of Turkey at the time, tried all the tricks it knew to deceive the people. The state owned tea company, the distributor of the contaminated tea, printed 1985 as the year of production on packages containing tea that was harvested in 1986. Selman Kinaci, the head of the Institute for Nuclear Science, now admits that they found radioactivity in the range of 50,000 to 60,000 Bq/kg which is more than a hundred times higher than the 'permissible' limits. However, at the time the scientists were not permitted to publicise radioactivity measurements and were threatened with disciplinary measures.

Unable to sell contaminated hazelnuts abroad, the government carried out massive distribution of the nuts in schools and to army recruits during 1990-1991. The government also exported 4-5 tons of hazelnuts to Russia.

Now, the consequences of Chernobyl on Turkey are becoming obvious. The leukaemia rate is twelve times higher than before. Gunduz Gedikoglo from the Faculty of Medicine at the University of Istambul and the head of a foundation for children suffering from leukaemia, says that, "We have looked at all potential reasons for the unnatural increase in leukaemia rates, and the only reason is Chernobyl."

The current government is using the then government's response to Chernobyl as a stick to beat the "Motherland Party", which was then in government. As more and more facts about the whole scandal become known, hundreds of charges are being levied against people responsible. Headlines in Turkish newspapers read "Chernobyl criminals to court!"

Anatolia news agency also reported recently that Turkey would soon have its first nuclear power plant. Yalcin Sanalan, the president of the Turkish Atomic Energy Agency said that "It is important to eliminate the psychological fears in Turkey caused by Chernobyl."

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While the increase in number of deformities and leukaemia (12 times greater than before) are obvious and are admitted by the present government of Turkey, which uses these tragedies as a stick to beat its political opponents who were the government at the time of Chernobyl accident, it too wants to take Turkey down the nuclear path. Yalcin Sanalan, the president of the Turkish Atomic Energy Agency **said** that "It is important to eliminate the psychological fears in Turkey caused by Chernobyl."

Public Awareness at Kalpakkam

Bhopal, Chernobyl, Three Mile Island are names which recall scenes, of horror and panic caused by large scale industrial disasters of recent past. It has been claimed, by nucleocrats among others, that the reason for the large scale devastation and loss of life involved in some of these accidents is due to the fact that people were not prepared in advance for the accident and its consequences. Of course, after any such accident, the first declaration from the authorities that one hears is that such a disaster is inconceivable in 'our' system. That ritual done, the next pronouncement one hears is that 'lessons' are being learnt from the catastrophe and the misfortune is some kind of a blessing in disguise, since it would mean that there would be better preparedness for future accidents. The accidents we have mentioned took place quite a long time back, so that one would expect that at least now, after a period of so many years, we are in fact well prepared to deal with any kind of nuclear calamity. In fact, after the Chernobyl disaster, an "emergency preparedness plan" was prepared and a number of drill and exercises involving the nuclear plant authorities and the civil authorities have already taken place in all operating nuclear plants in the country. The first time such exercises were undertaken in 1988, there was total confusion and panic. (See Anumukti vol.2 no.2/3) However, now that a number of such exercises have been conducted, the time is probably right to take stock, and see if the people in areas surrounding nuclear power plants are aware of their role in an emergency.

Makkal Ariviyal Iyakkan (People's Science Movement, Tamil Nadu) have recently undertaken this task, and conducted a survey of villages around the Madras Atomic Power Station (MAPS) at Kalpakkam in Tamilnadu. Their report is entitled "A Sample Survey On The Peoples' Preparedness in Case Of An Emergency And The Economic Effects .On The People Around Kalpakkam Nuclear Power Plant". Besides including the results and analysis of the survey carried out in 1992, the report contains additional information concerning the nuclear industry in the region and the perceived economic benefit to the population of the region.

Alms

- **To investigate the awareness of local people to the health and safety issues surrounding nuclear power and to gauge the potential reaction of people in case of nuclear accident**
- **To obtain the opinion of the local people as to their current and prior economic situation in order to gauge the actual effect of a capital intensive energy production industry on the people living in the area.**

Methodology

The Kalpakkam plant is located midway between Madras and Pondichcry, about 80 Km south of Madras, on the coast of the Bay of Bengal in Tamil Nadu. It has two reactors operating for the last 9 years. Amongst the villages which are spread all around the plant, are a number of fishing hamlets. The area experiences cyclonic storms almost every year during the winter monthi.The survey covered 36 villages and 21 PanchayaU within a 16 Km radius of the plant 369 people were surveyed either by individual or group interviews. Amongst the participants of the survey 12% were female and 88% were male. The caste distribution of the survey participants was 1.6 percent forward castes, 68.8 percent backward castes and 39.4 percent scheduled castes and tribes.The educational qualifications of the participants varied from illiterate (32%) to above 10th standard (6.7%). The survey was conducted only amongst adults with 27% aged between 18 to 26 years, 33% between 25 to 36 years and the rest 40% being over 40 years of age. Special efforts were made to contact panchayat chiefs. The caste composition and the educational distribution of the survey participants reflects the overall distribution of caste and literacy in the area.

RESULTS

The survey tried to gauge people's knowledge on two aspects

- **Radiation and its Effects**
- **Knowledge regarding what action to take in case of an emergency**

Report of an Interview with a Panchayat Chief

Below we reproduce verbatim an interview with a panchayat chief to illustrate the level of ignorance amongst these functionaries. M.A.I. stands for the interviewer, while P.C.denotes the panchayat chief. It is well to keep in mind the fact that these people form the main link between the authorities and the people and who are expected to be the main source of information and leadership in an accident situation.

MA.I. : How will you get the message of a nuclear mishap?

P.C.: I will get the message from the Village Administrative Officer.

M.A.I.: Where does he stay?

P.C.: His permanent address is in Tirukalikundram, which is about 10 kms from here.

M.A.I.: Then how can he inform you in the evenings or the nights?

P.C.: (no answer)

M.A.I.: Where will the bus to evacuate people come?

P.C.: It will come near the temple tank.

M.A.I.: What will you tell the people?

P.C.: I will ask all of them to assemble near the indicated place.

M.A.I.: Is there any shelter there?

P.C: No.

M.A.I.: How many buses will come there?

P.C.: Two or three buses.

M.A.I.: What is the population of this village?

P.C.: There are about 400 houses with about 1,000 adults. Total population may be about 2,000.

M.A.I.: Where will they take you?

P.C.: To some place near Katankalthur, which is about 60 kms away.

M.A.I.: How long do you think it will take to evacuate everybody?

P.C.: Well, I really don't know, but we can calculate. A up and down trip takes about 3 hours. In one trip about 70

P.C.: We are the only ones. Who else?

M.A.I.: Does that mean that you will not leave this place for two days till the last person has boarded the bus and all the people have evacuated?

P.C.: Um...!

M.A.I.: Where will people stay till they board the buses?

P.C.: Why? They have to wait here for the bus.

M.A.I.: Weren't you told that it is better to wait indoors till the bus arrives?

P.C.: I did hear something like that. But it is not practical. People will be panicky and would want to board the bus at the earliest. How is it possible to expect them to stay indoors ?

MAJ~ What about your food?

P.C.: Food! We have no choice. We will eat whatever is available. We hope the government will help us.

M.A.I.: What about the water?

P.C.: We normally drink the water from that well nearby.

M.A.I.: What about vegetables and milk?

P.C.: We can't afford to buy vegetables and milk from outside. We eat what we grow.

M.A.I.: But will you continue to use the water from the well and the locally grown vegetables and milk even after the accident?

P.C: Yes, of course. Why not?

MAX: Were you not informed that all the products lying outside have a fair chance of getting contaminated and

On the basis of the replies received, the participants were characterised as belonging to three categories:

- Those who were unable to give any coherent answer at all to the question were classified as ignorant (53%).
- The second category was "knows something but not clear". Thus anybody who said that radiation can cause health hazards was put in this category (34.5%).
- Any body who said that radiation can cause heath hazards when limits are exceeded, and this has a genetic effect, was classified as "possesses minimum clear knowledge" 12.5%) (*I would not agree with this definition - Editor)*

Only 12.5% of participants fell into the minimum clear knowledge category. Of these NONE were women. Most were forward caste and with higher qualification. Age and distance had little bearing on the knowledge base.

Similarly, people were categorized in the same three categories depending upon their knowledge of what to do in case of an accident. The percentage in the "Ignorant" category—(No coherent answer) was 68.8%. 26.6% of the respondents answered "We have to run. Government will help us. They will tell us what to do." Only 4.6% of the respondents who said that, "We should stay indoors till help comes. If at all we move in a vehicle we should move in the opposite direction to that of the wind," can be considered to possess minimum clear knowledge.

In this sample the knowledge base was found to be independent of qualifications or age. It is interesting to note, however, that none of the participants in either the highest qualification category or the forward castes possessed minimum clear knowledge.

The surveyors note that the number of people who clearly know what to do in an emergency is dangerously low. The number of people who "know something but are not clear" are as vulnerable as the totally ignorant lot since the probability that in an emergency they would take the wrong step is high.

The number of people who clearly know what to do in an emergency is dangerously low.*

The organisers of the survey made "special attempts" to meet with Panchayat Chiefs. See Box for a verbatim report of a conversation with a Panchayat chief.

The report states that, of the four Panchayat Chiefs interviewed, "none of them knew that they have to stay indoors. A wet cloth on the nose will help, outside uncovered food and vegetable should not be used, only water kept inside should be used ... , where buses will come and how they will regulate people to buses, how much time or how many days it will take them to evacuate, what will be the facilities that will be provided, who are to be evacuated first"

Economic Aspects

Besides focussing on emergency preparedness, the survey also put question to the participants on their economic well-being due to the plant It is generally claimed by the governments that such mega-projects 'develop' the local area, and create new employment opportunities and 'elevate' the general condition of the people. About 700 crore rupees of public money were spent to set up the MAPS complex. Since there are about 3,500 permanent employees and about an equal number who work as casual labourers on a temporary basis, this works out to about Rs 20 lakhs spent in the creation of just one permanent and one temporary job! In order to focus on the benefits received and economic penalties that might have been paid, by the local populace, the following queries were put to the respondents:

- 1.Whether there was any change in their income due to the plant
- 2. Whether they or their family members had got any jobs (government/ contract /other)
- 3.Whether they felt that the cost of living in the neighbourhood had increased due to the high income employees of the plant

It became apparent in the survey that the first two points are dependent on the distance between the home and the plant. Those living close to the plant got considerably more 'contract labour' work. However only 2.2% of the people surveyed very near the plant got permanent Group D (sweeper/helper) jobs in the atomic energy establishments. And from the data it seems that their age and qualification has not given those living near the plant any advantage in obtaining permanent jobs.

Only 15% of the respondents had obtained contract labour jobs. And these jobs have not affected their economic status in any way. Of the people who haye got jobs, most were from the less educated and the scheduled castes. The survey concludes that "the scheduled castes who are normally farm 'bonded' labourers, prefer to come out and work as coolies for marginal or no economic benefits. This in a way gives them freedom from their age old feudal masters, but only to serve their new masters." The report goes on to say that this appears to have 'loosened the traditional feudal grip on the harjjans."

Not a single woman in the survey had a permanent job in the government or allied establishments.

During the course of the questioning other relevant information also came to light "It was found that many of the people whose lands were taken for the project were promised jobs but were not given them. They feel they have been deceived and show their 'certificates of preference* given by the Thasildars with anguish and despair."

The authors of the survey conclude that "the local economy has been imperiled by an increase in the cost of living and the accentuated economic differentiation." They feel that "Rs 700 crores of public money has brought in only economic deprivation along with high risk dangers to the local people. All the so-called 'economic benefits' have accrued only to those already better off or to the salaried classes coming from other parts of the country. The response among the 'beneficiaries' (those living within 5 km from the plant site) to a proposal for a new reactor in the area was vehemently opposed to the whole idea.

In the area near the plant and also in the area near the township for the workers of the plant, people overwhelmingly believed that the cost of living had risen since the construction of the plant And a comparison with villages 30km away indicated that prices were indeed higher in this region.

Other Information

Besides the survey there is some additional information concerning water usage and salinity resulting from the Kalpakkam plant's massive use and diversion of water. The township has a population of around 20,000. These 20,000 people consume 5.56 million litres of sweet potable water every day. Besides this consumption, the plant itself also uses 6.4 million litres of sweet water daily. This water is pumped from huge pumps installed in the bed of the Pallar river. The location is also the source of water for some suburbs of Madras city like Maraimalai Nagar, Tarmbaram, Pallavaram, etc. This huge extraction of water from a river which has very little surface flow most of the year and none during the summer months, has resulted in a depression of the ground water level by 30 to 50 feet The pane hayat chief of Vayalur village claimed that sea water has already penetrated into the subsoil strata and the resultant salinity has devastated about 100 hectares of land in the area.

It seems that "this technology is totally alien to the local population and hence people are not in a position to even comprehend it".

Makkal Ariviyal lyakkan

> "People have a right to know the dangerous activity that is going around them. They also have the right to accept or reject such an activity based on their capacity to comprehend the danger."

Radiation and Chromosomal Instability

ritish researchers Murina Khadim, DA.McDonald, ___ D.T.Goodhead, S.A.Lorimore, S.J.Marsden and E.G.Write of the Medical Research Council's Radiobiology Unit in Oxford have developed evidence that alpha-particle irradiation may cause a previously undetected form of radiation injury. If this finding is confirmed, there would have to be a reassessment of the harm done by alpha radiations, which have been ignored till now for the lack of effective monitoring techniques.

As is well known, ionising radiation, whether gamma, beta or alpha and x-rays, can harm human beings quickly or slowly depending upon the intensity of exposure. Effects can range from prompt death to acute and delayed (days to months) radiation sickness, to long delayed (years to decades) latent cancers, and other mutagenic breakdowns (generations).

Current radiation safety standards are in large part based on statistics for external radiation. These standards assume that high-energy penetrating radiation (such as gamma or X-rays) is significantly more dangerous than alpha radiations "which can't penetrate a piece of paper".

What the British researchers' experiments suggest is that alpha particle radiation will damage a cell even when it misses the genetically significant DNA in the cell's nucleus. Heretofore, the expectation has been that radiation damage to genetically significant DNA would produce a clonal (identically repeated) aberration, whereas radiation damage to any other part of DNA was previously thought to be a phenomenon that was effectively repaired, removed, harmless, or that did not occur. The British research suggests that radiation damage to the non-genetic DNA may in several generations, produce a variety of abnormalities, not just the single, identically repeated transformation resulting from damage to the genetic DNA.

Each cell in the body consists of a nucleus in a body of fluid called cytoplasm. An alpharparticle, traversing a cells cytoplasm but bypassing the cell's nucleus and its contained DNA, may cause a physicochemical derangement of only the cytoplasm. This disorder of the intracellular metabolic environment may, secondarily, disturb the nuclear DNA and cause a consequent "chromosomal instability*.

Although about 80% of the cells targeted are likely to be killed outright, some will survive to replicate. These may show no sign of their altered internal state for many generations. When they do, however, their appearance shows varied and multiple alterations, rather than the single repetitive clonal pattern seen in surviving generations of cells subjected to low energy transfer gamma or X-ray irradiation.

This variety of chromosomal change in daughter cells after alpha irradiation makes the nature of the radiogenic effect of a single impingement difficult and doubtful, if not impossible, to identify or predict-not merely for a given cell or set of cells, but especially for a total organism such as a human being. Only the pattern of new and diverse changes not seen under previous low level irradiations confirms the phenomenon and its interpretation.

The Prevailing Theory of Carcinogenesis

Briefly described, cancer formation is understood to be a process of initiation of a normal cell to abnormal growth, known as transformation. Growth is manifested by cell reproduction. Only after one or more such "clonal" cell replications is completed, does the cancer process, or expression become fixed or established. Clinical appearance in the form of a tumour will appear some months or even years later, depending on many promotional, hereditary or immune, latency and inhibitory factors. Such transformations may be both genetic or epigenetic. In a genetic process, the "human cancers occur as a result of changes or damage produced in the chromosomes of DNA of cells. Every irradiated cell is in-

All we have been told of the hazards of alpha radiation has been minimised by the assurance that exposure is very slight. Now this study suggests that deleterious changes can be expected, belated and variable. It suggests that such changes will be inherited.

itiated. Only a very small proportion produced transformed colonies (tumours)." In an epigenetic process of cancer formation on the other hand, other changes and damage are presumed to result from "regulation of DNA activity" by physicochemical influences outside the genetic DNA sequence and structure, hence the term epigenetic.

The "chromosomal instability" phenomenon due to alpha radiation may be such an epigenetic process. Its demonstrated durability and persistence after many cell replications gives one pause to reflect on species implications. The potential for both metabolic and genetic cellular alterations and aberrations are vast, diverse and immeasurable.

Cancer is the most readily identifiable human disorder caused, contributed to, or facilitated by low level ionising radiation, but cancer and deaths are not the only outcomes of chromosomal instability.

Implications

Initiation of cellular transformation leading to cancerous growth may occur due to low or very low ionising radiation without the invasion of the cell nucleus or a direct impact on nuclear DNA.

Chromosomal instability materialises visually only some generations after the non-lethal radiation impact on the surviving cells.

While only 15-20 per cent of the cells exposed to the study's "very low doses of alpha radiation" survive, nevertheless 60 per cent or more of the surviving cells will show changes resulting from the exposure.

Heretofore, everything we have been told of the hazards of alpha radiation has been minimised by the assurance that exposure is very slight Now this study suggests that deleterious changes can be expected, belated and variable. It suggests that such changes will be inherited and epigenetic, likely to show up as physical changes in later generations. Further, the study suggests that even very small exposures at the subatomic level are cumulative.

This points towards the conclusion that any man-made isotope has an impact on the global ecology, sometimes for millennia. Americium-241 is a case in point: It is used in smoke detectors for homes and commercial buildings. Only 1 micro-Curie of americium-241 is used in each smoke detector, but there are some 12 million of these devices distributed each year in U.S.A. alone. With a half-life of more than 400 years, americium-241 will remain potentially destructive for a period almost as long as human history to date.

Radiation Events Monitor
Center for Atomic Radiation Studies
P.O.Box 1036 Cambridge MA USA.

The Whitewasher Extraordinary

R. Ramachandran, the science editor of *The Economic Times* is something of a rarity. He belongs to an almost extinct breed: the pronuclear activist Now, there might be many who hold pronuke views, but they are not active. Even amongst the employees of the Department of Atomic Energy, there are many who are not only not active, but also not pronuclear. They are just doing a job — a technician's job or a scientist's job or an administrator's job, with no clear conviction as regards the nuclear issue. Ramachandran is exceptional since although he is not on the nuclear payroll, he has through his articles done more than anybody else in trying to resurrect the proverbial figleaf to cover nuclear mismanagement and excesses.

In my view, having somebody like Ramachandran in the pronuclear corner, is an advantage, since unlike the paid spokesman in the nuclear lobby, he is both knowledgeable and has the ability to express his views with clarity. Thus, his contributions help to raise the level of debate from the rock-bottom of name calling and appeals to patriotism that is the staple from the 'authorised' members of the nuclear establishment

-CIRUS LEAKS—No cause for alarm" is his latest offering which was published in *The Economic Timet* of 19th Decernber, 1992. Normally, it would be best to reply to such articles by writing letters to the editor. Unfortunately, I first saw the article just yesterday, (24.2/93) when Ashok Kumar sent a cutting from Bombay. It is already too late to reply by writing a letter to the editor, and moreover I want to bring this topic up in *Anumukti* so that readers can become aware of the mixture of half-truths and deliberate omissions that forms the pronuclear argument I am not reprinting the article in full over here, since for one it is too long and secondly I feel that we do give more than enough space for the pronuclear point of view. What I will do instead is to quote illustratively from the article as a specimen of the Ramachandran style of disinformation. All those who are interested can of course look up *The Economic Times* of 19.12/92 as well as *Anumukti* Vol.6 No.l. for a reprint of the original article by Rupa Chinai in *The Sunday Observer* which first highlighted the problem. Ramachandran states,

'While the media does deserve the credit for highlighting the incident, unfortunately such events tend to be projected with alarmist hues. For the public at large, scientific terms and units of radioactivity and its exposure such as curie (Ci) or bacquerel (Bq), rod or Gray (Gy), rem or Sievert (Sv) do not mean much unless the numbers are put in the proper perspective."

After this fine preamble, Ramachandran then promptly proceeds to take advantage of the public's ignorance of these units by piling upon his readers heaps of data in different units. Thus we have

"December 14, .1991 - Radioactive water found to be leaking into the excavated pit. The water sample was found to have an activity of 40 Bq/ml. (One bacquerel corresponds to one radioactive disintegration per second—human body contains 4200 Bq of pottasium-40, i.e. 15 million distintegrations per hour, 455 Bq of rubidium-87 and about 2900 Bq of carbon-14; Milk contains 45 Bqll of potassium-40.)"

Along with this Ramachandran also gives two tables. One titled "Median Values of Cs-137 levels" and the other "Radiation Doses to public through food". The first gives values of cesium-137 activity in sea water, marine organisms and solar dried salt for various years from 1983 to 1992. The units in these values are mBq/1 and the values range in the case of sea water from a low of 40 in 1991 to a high of 836.2 in 1984.

Let me borrow Ramachandran's own words and put these numbers in "the proper perspective". The impression one is apt to get from a reading of the article is, why are the antinukes in such a flutter over a mere 40 Bq/ml whereas the human body contains 4200 Bq of radioactive potassium, not counting the rubidium-87 and the carbon-14. What Ramachandran so conveniently fails to mention is that the human body in question is that of an adult male with a hypothetical weight of 70 kilogrammes. Thus the equivalent number in the same units (Bq/ml) for the radioactive potassium in the human body is 4200 divided by 70,000 which is equal to 0.06 Bq/gm. (Since the human body consists mainly of water and one millilitre has a mass of one gramme there will not be any significant error in replacing Bq/gm with Bq/ml.) Or in other words, an amount of sea water lying on the grounds of the Bhabha Atomic Research Centre equal in weight to an adult human being would have given off not just 15 million but 10,000 million disintegrations per hour.

However, even this is not the whole story. It is just the beginning. As the table headed median values of Cs-137 levels mentions, the radioactivity of sea water in the year 1991 was 40 mBq/1. Since the water was leaking from a pipe which was bringing in sea water into the complex, the radioactivity of the water in the excavated pit ought to have been 40 mBq/1. Instead it was 40 Bq/ml. The small m, is a factor of a thousand which instead of dividing is multiplying the coinci den tally identical value. Thus, the amount of radioactivity in the water leaking from the pipe was a million times more than what it was in the sea from whence it came. The question is how come?

The cause of this extraordinarily high value of activity was due to leakage of nuclear waste from another pipe which had contaminated the soil of the whole area to a dangerously high level and the water leaking from the sea water ingress pipe had picked up some of that activity. The soil in the area was contaminated to the extent of 1,000 to 60,000 Bq/gm. In other words the soil was a thousand times more contaminated than the leaking water which itself had a million times more radioactivity than the 'natural' radioactivity in the sea. Putting all the numbers in the same units allows the concerned readers to form their own perspective, rather than relying on the "proper perspective" of interested partisans.

I will give just one more example of Ramachandran's selective use of facts and advocacy style of journalism. Consider this

"To contain the radionuclides a vermiculite layer of 30 cm followed by fresh soil, has been used to fill the pit. This is expected to retard the migration of the radionuclides. The radiation field at this spot after filling was found to be 0.4 microsievert I hour. A person working at that location for 40 hours a week for 50 weeks a year would be exposed to a dose of 0.8 mSv. The annual dose limit for a radiation worker is 20 mSv."

However, this needs to be read in conjunction with the following

"December 20 1991—Entire area surveyed. High radiation field on pit top (with dose rate of about 300 millirem/hr) detected requiring remedial action.

And also this

"Based on the radioactivity level ratios of the short-living Cs-134 and long-lived Cs-137, investigations have concluded that the leakage had been taking place for some years at least. Since the

leakage woe at a totally unexpected spot which is not under routine surveillance it remained undetected, according to Atomic Energy Regulatory Board."

Now let us do the same exercise as Ramachandran does and estimate the annual dose to a worker who might have worked at the spot for 40 hours a week for 50 weeks a year for the unknown number of years before the leak was detected, because it "happened at a totally unexpected spot".

1 rem is a hundredth of a Sieved, and thus 300 millirem/hr is equal to 3 millisievert an hour or 3000 micro8ievert an hour. Thus, the yearly dose comes to 6000 millisievert (mSv) which is merely 300 times the annua) dose limit for a radiation worker.

Of course one needs to remember that this is an academic exercise. Nobody was working at the spot which happened to be the lawn behind the CIRUS reactor. However, people did loiter there and the dose that they received at the place was in addition to the presumably 'monitored' dose they received during their regular work. The mora) of the story seems to be: Do not loiter while at work in the Bhabha Atomic Research Centre. Unexpected places can kill you due to unexpectedly high radiation levels.

These numbers indicate a very different picture than the one Ramachandran has tried to present. They indeed constitute a cause for alarm. However, Ramachandran's main thrust is different He is basically trying to tell his readers that although there has been an accident within the BARC complex its implications for the people outside are minimal and the general public can rest content that these "anomalous radioactivity releases have had no adverse impact".

In his own words,

The most important concern i§ whether the leakages have led to any appreciable increase in the radioactivity levels in tea-water and marine organisms. (See Table 1) The BARC conducts tests on tea water, tolar salts and marine organisms of over a hundred samples every year collected from 18 locations. These tests have demonstrated that during 1992 there has been no detectable increase in the concentration of the radionuclides. "

For all anybody knows, this contention may well be true, but how is one to know. It might have so happened that for many years past leakage in the radioactive waste carrying pipe has deposited this waste in the vicinity of the reactor and has mercifully not carried them out to sea. Unfortunately, the source .of all the reassuring figures and tables that Ramachandran presents is BARC itself-an interested and discredited party, as even Ramachandran would agree.

However, Ramachandran has another argument to assuage public fears in case these BARC generated numbers fail to impress, and this ace up the sleeve is that famously (in their own words) "independent* body, the Atomic Energy Regulatory Board (AERB).

"Even such a low-index event cannot be hidden by the BARC authorities even if they wanted to, because there is a regulatory authority to which they are answerable—the Atomic Energy Regulatory Board. One would have been accused of being extremely naive to swallow this some years ago when the autonomy of the Board was always in doubt. But now the Board does appear to have come into it own.*

As a proof of the Board's independence, we have in 14 points bold highlight the following

In July, AERB wrote to the BARC director expressing his serious concern over sub-soil contamination.

Suffice it is to note that in this very instance of the leaking pipe in BARC, the reactor authorities showed their contempt for AERB directives and restarted the reactor on February 5th 1992, at a time when the pipeline had not been repaired, while the Reactor Safety Committee had asked them not to start the reactor till all the leakages in the pipeline had been isolated and repaired. This disdain of AERB will continue to be a regular feature of DAE facilities till the body becomes truly independent and takes its regulatory role seriously and not as a part of "allaying public fears".

The nuclear establishment in this country is a huge operation and has a large number of paid propagandists, public relation officers media specialists and the like. Over the years, they all have managed through persistent deception and due to their total disdain of the concept of public accountability, to have lost their credibility. Nobody gives two hoots for their 'cooked' data. Thus, their need for a supposedly 'independent' expert like Ramachandran is obvious. It is a pity however, that Ramachandran has let his obsession with the nuclear dream to get the better of his scepticism which ought to be the bedrock of any scientist.

Surendra Gadekar

February/March 1993

Anumukti for Peanuts!

Two hundred and fifty rupees may not exactly feel like peanuts. But in these inflationary times with the government dedicated to squandering our money, it may not be long before even peanuts may not be available at this amount. But Anumukti would be if you make a lifetime subscription, (just Rs 2501-) right now. (This offer is valid only within India.) This is your last chance of getting Anumukti at this special rate. Starting with the next issue, the lifetime subscription rate will be Rs 5001-

Robotics Nuclear Style

According to a television documentary broadcast late last year,it was common practice in the first East German nuclear reactor at Rheinsberg (70 km northwest of Berlin) to send people into the conduit pipes of the primary coolant system to check for welding cracks and possible leaks. During the inspections, the water in the pipes was released and the interiors of the pipes were cleaned by a chemical substance to remove radioactive particles. The workers some of whom came from a Yugoslav firm, climbed into the pipes. A rope was attached to their feet so they could be pulled out. No figures have been released regarding the amount of radiation the workers were subjected to in this procedure. Robot cameras were not then available in the GDR. But since the emergency core cooling system was not sufficient, a failure of the primary cooling system would have proved fatal. Thus inspections were obviously very necessary and important. The Rheinsberg Reactor—a 70 MW reactor of Soviet design—began operation in 1966 and was shut down in June 1990. It is being prepared for decommissioning, which is expected to last till 2009 and cost an estimated 800 million German Marks.

WISE News Communique 386

Subscription Information

Rs. 25/- per year (6 issues) for South Asia
U.S. $ 15/- per year or equivalent In other currencies for airmail overseas.

Rs. 250/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531)
For cheques and drafts drawn on other banks, please add Rs 6/- as clearance charges.

Anumukti Team: P.P. Baburaj, Sanghamitra and Surendra Gadekar

Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampooma Kranti Vidyaiaya
Vedchhi, District: Surat. 394 641
India

Please do not send cheques or drafts addressed to Surendra Gadekar
Published by S.Gadekar for Sampooma Kranti Vidyaiaya and printed at The Parijat Printry, Ahemedabad

PRINTED MATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 6 Number 5 April / May 1993

A Special Issue On

RAWATBHATA

From The Editor's Desk

Th [illegible] ta survey took p [illegible] h September to 2 [illegible] ber, 1991. It is now May 1993. A report which **we had** expected to complete in a few **months** at **the** most has taken the better part of two years. Yet, the task is not complete. What we present here is in the nature of a preliminary summary of the main conclusions. By preliminary, we do not mean that the contusions drawn are tentative and subject to change on further analysis. The conclusions are firm. But a final report would require a large amount of detail, which for reasons of economy of spare and also because we felt that it would not be of great interest to most readers of *Anumukti,* we have omitted from this narration.

We expect the full report to run to well over 100 pages. It would contain all the data along with various cross-tabulations. It would need illustration and we have a number of photographs for the production. The production costs of a properly brought out document are likely to be high. It would require a great amount of our time and effort. Although most of the analysis is already complete, the writing of the full report remains a formidable assignment. Before launching ourselves into this task, we would like to know if people are interested in the outcome. So, please write a letter to us letting us know if you are interested in buying a copy of the report. If we get more than a hundred advance orders we would certainly produce the report. In case, not many are interested, we would publish the material as a series of technical papers in various journals.

There remains the question of the language of the report. We feel **that** the information most **intimately concerns people** who do not know **English, but most people** who have the time to devote to read such reports prefer English. If we get even 25 orders for **a** Hindi version, we would **be** very happy to bring out a Hindi **version** also.

Conclusions of the Health Survey of Villages Near Rawatbhata

- An extraordinary rise in congenital deformities
- Spontaneous abortions, still-births and one day deaths **of** new **born** babies significantly higher
- Significant increase in chronic diseases especially amongst the young. No differences in acute infections
- Solid tumours significantly higher
- A difference of more than 11 years in the average age of people who have died in the last two years
- More cancer patients and cancer deaths in villages near the plant
- Significantly lesser number of electrified household and pumping set connections near the plant

Supreme Court Asks the Government to Reconsider Kaiga Atomic Power Project

Final hearings are in progress in the case filed by antinuclear friends in Karnataka against the Kaiga Atomic Power Project in the Supreme Court. In an interim order, the Court has asked the Government of India to reconsider the project.

Kaiga is **the** only **place in the world where a nuclear power plant is being built in the midst of a tropical rain forest. The project is a specially heinous crime against the environment.**

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ANUMUKTI

A Journal Devoted to Non-Nuclear India

A special issue on

RAWATBHATA

Conclusions

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Faustian Bargain

Nuclear technology was called "A Faustian Bargain" by AIwyn Weinberg, one of the pioneers of the field. In Faust, Mephistopheles does fulfil his part of the bargain What about in Rawatbhata?

The people of the area around Rawatbhata never made any bargain with anyone. The bargains were made in their name, in Delhi and Bombay and Ottawa. The people have certainly paid a heavy price. We would call it an unacceptably heavy price. But, what have they paid it for? What difference has this temple of modern India made in the life of Dhapo Bai of Malpura, or Bhanwarlal Bhil of Tamlav?

We must remember that RAPS was not the first encounter these people had with development. Before RAPS, there was the Rana Pratap Sagar Dam. Some of the people presently living in the villages that we surveyed are refugees from that first bout of progress. There is no doubt that the one thing that has been achieved is the destruction of the traditional way of life. We found that whereas the residents of the distant area do find employment within their villages, the people in the proximate,area are totally dependent on RAPS. Not only for employment, but also as a market for their produce and services.

Modern development means concrete things to people. Things like better roads, telephones, schools, better health care facilities, pot* able drinking water for which one doesn't have to walk for an hour, electric lights, irrigation, etc. We found that for any of these criteria, the distant villages were either distinctly better off or certainly no worse than the villages near the nuclear power plant. We have already, in the results section, commented on the fact that while less than 20 percent of the households in the proximate area had electricity, the number of such houses in the distant area was 52 percent. Regarding potable drinking water, the Central Water Commission has given its verdict (page 28).

Let us focus our attention on the health care facilities. Till the time of the survey, there was no primary health centre in any of the five villages. This made it imperative for the villagers to go to Rawatbhata in case of any medical emergency. There were only two buses in a day plying between the villages and Rawatbhata. (Tamlav in this case is an exception, since it is situated on the main road and is consequently better connected.) Both the buses reach Rawatbhata after the primary health centre there has closed for the day. Of course, there is a modern hospital in Rawatbhata, equipped to deal with any medical problem, but its services are meant only for the 'regular staff of RAPS and not for the hoi-polloi. Casual workers at such times are not considered 'nuclear' workers and certainly not 'staff. In fact, requests by-the'public for admittance to the RAPS hospital are considered as "attempts to blackmail" (see page 23).

From time to time, there are stories in newspapers of superstitious people who practice human sacrifice in the hopes of finding buried treasure. These stories justifiably fill us with horror not only at the gory deed, but also at the superstition. When will we feel the same horror and revulsion towards the modern superstition of development which requires many more human sacrifices?

Acknowledgements

First of all, we would like to express our sincere gratitude and thanks to the people of Rawatbhata and Rampura areas, without whose unstinted cooperation and help the survey would not have been possible.

Young people, students and doctors from different parts of the country came for the survey, giving their time, and spending their own money. We can never forget their dedication and selflessness.

The help given by Dr Leela Visaria and the Giyarat Institute of Development Research, Ahemedabad in design of the survey was what allowed us to even think of under* taking the survey in the first place. IIa Mehta and Vinayak Dave of this institute were the coordinators of the data collection team and their professionalism was marvellous.

Rajeev, Ratna, Nivedita, and Vidya of the Network to Oust Nuclear En ergy, were responsible for recruiting the volunteers from Delhi. It was Ratna's will to see the survey through which gave us a new impetus at a time when we were feeling rather depressed.. Rajeev and Ratna did so many chores that it would take pages to just enumerate them. The role of Shri Ram Pratap Gupta of Rampura College was crucial. He made all the arrangements at Rampura and also inspired his students to join the survey team. Ms Sudha Hardikar put us all to shame with her apetite for hard work. Aradhana's meticulousness helped us maintain a uniform standard of data col* lection in both areas.

Acknowledgements cannot be complete without mentioning two names from Rawatbhata. They have already suffered so much harassment that they are immune to any further provocations. Jaan Mohammad Saheb not only opened the doors of his hotel to us, he opened the doors of his heart. And more than anything else it was the courage and the perseverance of Shri Ratanlal Gupta—Sarpanch of Rawatbhata, which carried the survey through.

Introduction

During the 1950s and 60s, in the first flush of freedom, development came to the bank of the river Chambal in south Rajasthan. Dams were designed, barrages built, power stations put up. Kota, which used to be a sleepy mofussil town, was transformed into the industrial hub of the region. New townships sprang up. The story that follows is a story of one such 'temple' of modern India located on the banks of Chambal: Rawatbhata, the atomic town. But to bring out into full focus the assorted threads of development, it is necessary to contrast this shining new temple with an old semi-deserted ruin, another habitation just 50 km upstream on the Chambal—the town of Rampura in the adjoining Mandsaur district of Madhya Pradesh.

The "Fall' of Rampura

The first recorded reference to Rampura in historical records occurs in 1434 AD. It is well established that even as early as 1730 AD, Rampura was a prosperous town. It was the capital of a state of 661 villages and had an income of Rs 8 lakhs. However, in the 1750s, its administrative decline started when it was annexed and made part of the Holkar state. Despite this, eighty years later, in 1830s according to Sir Malcolm Hamilton, it was a town of 4,000 houses with a population around 20,000 to 25,000- Its sworda, metal work, wood work and cotton and woolen weaving were famous.

The first major economic shock to this town was delivered by the building of the B.B & C.I. railway line. The railway bypassed Rampura which slowly lost its importance as a centre of commerce and trade. Industrialisation meant the local cottage and village industries were slowly obliterated. All this plus two severe droughts resulted in the first large scale emigration from Rampura area. The population declined by 30% in the three decades between 1890 to 1920.

The second blow to Rampura was delivered by the construction of the Gandhisagar dam on the Chambal. The hinterland of Rampura-the villages whose products were sold in its market-all went underneath the vast expanse of the Gandhi Sagar Reservoir. Rampura's population today is less than 10,000 and the vast beautiful ruins of empty houses and old havelis bear testimony to a glory gone by.

The Rise of Rawatbhata

Rawatbhata, on the other hand is a place which prima facie has prospered under development. Like Rampura, it too is situated near a dam on the Chambal - in its case the Rana Pratap Sagar Dam. But unlike Rampura, its population during the last thirty years has grown The building of the dam was followed soon by the building of the atomic power station complex Rawatbhata was selected as the site for the first pressurized heavy water reactor (PHWR) in India in 1961 and construction started in 1964. Unit-1 achieved criticality in August 1972 and was declared commercial in December 1973. The construction of the second unit started in 1967. It achieved criticality in October 1980 and was declared commercial on April 1, 1981. The station, known as the Rajas than Atomic Power Station (RAPS), is located around 5 kilometers south of the town of Rawatbhata, on the east bank of the Rana Pratap Sagar Reservoir. All this development activity brought construction workers and later engineers, operators, security staff, etc. and their families. Many people displaced by the reservoir flocked to Rawatbhata to try their luck setting up new businesses and providing various services to the burgeoning population. Today, Rawatbhata's population is somewhere between 30,000 to 40,000. The growth is still continuing since work has started on reactors number 3 and 4, and four more reactors are in the planning stage. However, one point needs to be noted. Despite all the power generated at Rawatbhata, there is no other large industry anywhere in the vicinity. The major consumers of Rawatbhata power are the industries located at Kota, fifly kilometers to the north-east.

Why Rawatbhata was Selected?

The -Site Selection (Committee was constituted in 1961. It was asked to select a suitable site for a 200 MW nuclear power plant in the general area of Delhi, Punjab, Rajasthan and U.P, In all, ten sites were considered. Of these, two were found unsuitable and amongst the rest Rawatbhata was found the most suitable. The criteria (or selection included availability of cooling water, the capacity and the suitability of the electrical systern, considerations of geology and seismology. The scarcity of population was a prime consideration. Some weightage was also given to other factors such as access to the site, availability of land, agriculture, daily and fishery products.

N.B. Prasad Committee which in 1982 investigated the causer for the generally poor performance of the station, agreed

WHICH the choice of Ravarthata as the site for the first in a series **of similar nuclear plants around the country, but expressed some unhappiness. In its own words:**

***"At the time of the selection of the site, there was very little experience with nuclear power generation anywhere in the world. Therefore the most* impartant guideline that determined the selection of the site was its remote location in an area of very low population density, whereby the consequences of a reactor accident would be minimised."**

"While the site selected by the Site Selection Committee met all the criteria adopted for the selection of sites at that time, the re-moteness *of the site adversity effected the operation and maintenance of the station. Tiu logistics were not satisfactory for quickly getting the required help nor were communication facilities satisfactory. It is difficult to quantify the loss of generation due to these factors but station staff have frequently referred to these difficulties."*

A Dismal Record

The history of operation of Rajasthan Atomic Power Station (RAPS) even when seen on purely technical grounds with no consideration for the human costs involved, is an extremely dismal one. Any objective analysis, based on criteria developed by the nuclear industry itself would also come to the same unflattering conclusion* Indian nucleocrats privately and in restricted circulation documents, admit to this sorry state. The following is an extract from the report of the Prasad Committee, which in 1982 went into the causes of this dismal performance.

"The analysis reveals that the operating record of RAPS-1 in the eight year period (from 1974 to 1982) has been somewhat chequered. There were bad years when the unit was totally shut down for long periods due to turbine blade failures or labour unrest. Intermittently, there were periods of slightly better operation, in 1974 and 1976, when the station operated at capacity factors of 40% and 46% respectively. There was a two-year period in 1979 and 1980 when the station operation was satisfactory and the stationi reached Capacity factors of 65% and 64% respectively. This has been again followed by poor performance in 1981 and a total shut-down during most of 1982.

The report of the committee (composed of bureaucrats from the Department of Atomic Energy and the Rajas than State Electricity Board) tries both to justify the choice of nuclear technology (in particular CANDU reactors), and simultaneously also find causes for the admittedly poor performance. It blamed the remoteness of the site, the poor communication facilities and the poor support from the grid with frequent and large fluctuations in the electricity supply, for the sorry state of affairs. In their own words:

"In Rajastan, all these years generation consisted of hydro and nuclear units only. Thus during drought periods there was no generation except nuclear available to the entire State of Rajastan and this has brought about tremendous pressures on the station management to keep the station going even under adverse conditions when they would have been better advised to shut down the station for plant maintenance. The result has been that RAPS did not get the operating environment foreseen in the design and could not be operated with the flexibility that was necessary for a prototype power station. Rqjastan in its turn, had to depend on what turned out to be a not so reliable power source for its needs, as forced outages at RAPS were for longer periods than normally associated with conventional power stations."

Lifetime generation of electricity from RAPS-1 has been less than 22 percent of rated capacity, while older Canadian plants of similar design have operated at 62 percent of capacity.

The Committee submitted its report in July 1982. It made many recommendations to improve the working of the plant. However, the crack in the South End Shield of the first unit has ended all hopes of better performance from this unit. In fact, since 1982, the unit was shut down for three whole years. (1983, '84 and '86) It has'since then, despite all efforts, produced less than 10 percent of its rated capacity. The performance of RAPS-2 has been in contrast far better. It has produced a little more than half its rated capacity. Contemporary units of Pickering Nuclear Generating Station in Canada have in contrast produced more than 90 percent of their rated capacity. Pickering is a much larger station with a capacity ten times that of RAPS.

Routine Emissions

O(licial data regarding emissions of radioactive waste from the plant are hard to come by. There is a publication known as the "CANDU Owners Group Newsletter", published monthly, which is a compilation of official data for the use of Canadian electricity utility executives. The only information regarding the Indian and Pakistani CANDUs that is available in it concerns the amount of electricity produced during the month and the duration of time that the reactor was working. Data regarding the quantity of various kinds of waste products released into the air, water and or buried in the ground, or data on the radiation dose received by workers is not reported by the respective nuclear authorities in either country. This 'secrecy' is in contrast to the Canadians - the ones who sold us this technology in the first place - who, to their credit, do publish this kind of data.

Bits and pieces of such Indian data have been published and are available in obscure 'places. For example, data about releases of various radioactive gases to air through the stack, from RAPS-1 from 1973 to 1980 have been published as part of Mr K.K. Narayanan's M.Sc. thesis (title: "Population Exposure from Nuclear. Power Reactor Operation), submitted to the University of Bombay in 1983. Mr Narayanan was a member of the Health Physics Division of the Bhabha Atomic Research Centre. I am thankful to Shri R. Ashok Kumar of Bombay for the trouble he took in unearthing this data. Similarly, data regarding routine releases for the years from 1986 to 1990 haw been published in a paper en* titled "Environmental Impact of PHWR type Power Stations - Indian Experience by a team of Bhabha Atomic Research Centre scientists—IS. Bhat, M.A. Iyengar, R.P. Gurg, S. Krishna mony and K.C PiIlai which was part of the conference proceedings on Small and Medium Scale Reactors held in Delhi in 1991. I am thankful to Mr. R. Ramachandran of the New Delhi bureau of *"The Economic Times"* for bringing this paper to my notice.

But, there are serious questions regarding the reliability of the little data that is available in India. For example, the data tabulated in Table 1 regarding tritium releases for the years from 1980 to 1990 are taken from the paper by Bhat, et. al. The same paper carries the numbers given in column 5 regarding the air tritium in a two to ten km region found by measurements, carried out by the environmental survey laboratory. These authoro claim they placed monitoring equipment at various points all around the plant, which made measurements at various times in different seasons and the values given in column 5 of table 1 are the averages for the year. Howeve'r, the numbers in columns 4 and 5 do not match each other. Thus, we

Year	Argon-41 TBq	Iodine-131 MBq	Tritium TBq	Annual Average Tritium Detected in a 2—10 km region Bq/m'
1973	367.3	95.3	25.3	
1974	157.7	287	87.8	
1975	3,959	1,220	223.3	
1976	3,209	1,450	545.9	
1977	4,026	5,550	525.4	
1978	1,034	183	531.9	
1979	4,015	1,900	1,905	
1980	5,393	5,920	1,117	
1986	4,106	230	661	2.6
1987	3,959	547	1,121	1.1
1988	5,767	10,019	1,028	1.3
1989	4,267	19,867	1,471	0.9
1990	10,640	1,398	2,566	1.0

Comparison With Pickering Station (4320 MW)

1989	—	1290	1463	22
1990	—	410	908	17

Table 1: Routine Emissions **from RAPS**

have *an* anomalous. situation where column 4 says that almost four times as much tritium was released in the atmosphere from the stack in 1990 as was in 1986. On the other hand, column 5 says that the amount of tritium found in the air during 1990 was 2.6 times less than that found in 1986. The two factors taken together mean that there is a discrepancy of more than ten times in the amount of tritium released and that detected. Where has all the tritium gone? It seems at first sight to be too large an inconsistency to be accountable to factors like weather. One does not know which of these two sets of numbers, if either, to believe.

Even if we set questions regarding the veracity of the data aside, and accept the numbers as given at face value, they do show that the amount of radioactivity releases made by our reactors are far higher in than the Canadian CANDUs of similar design and age. The Pickering Nuclear Generating Station (PNGS) consists of eight reactors, each of 540 MW capacity. Four started during 1971 to 1973, that is a little before the startup of RAPP-1. The other four started from 1982 to 1985, a little after RAPP-2. Four reactors of 540 MW mean a total generating capacity of 2,160 MW. Thus, the electricity generation capacity at Pickering has on an average always remained more than ten times that of RAPS. The life time load factor (the ratio of the electricity actually produced to what the station would have produced if it had worked at full capacity all the time) has been 67% and 84% respectively. For comparison, RAPS-1 has a lifetime load factor of 22% and RAPS-2 of 54%. This means that the Pickering station has over the years produced well over 20 times more electricity than RAPS. The radioactive tritium releases in the air have during recent years been greater at RAPS than at Pickering. The numbers for 1989 and 1990 are presented in **table *2.* Thus, the unaccounted pollution burden** of **RAPS electricity is at least twenty times and sometimes** even **(as in 1990) fifty times higher than that of electricity from** Pickering. **Similar** comparisons with newer Canadian reactors would he even more adverse for RAPS.

But tritium emissions to the air is just one kind of radiological pollution. One might ask about other radioactive poisons like iodine-131. A comparison of RAPS with Pickering data show that the released amount in both cases is of the same order of magnitude. There is no mention in the Pickering data of Argon-41, whereas this radioactive gas is the largest component of the poisonous combination emitting from the RAPS stack. Although Argon-41 has a short half-life, a huge amount of it is being released, so it contributes very significantly to the radiation dose being received by the public in the vicinity of the plant.

The radiation burden on the workers at RAPS is at least eight times as much as that on the workers at Pickering though in 1990 Pickering produced 50 times more electricity than RAPS

Other parameter's can be used to determine the comparative dirtiness of plants, such as, the total radiation dose received by workers. The Canadian plants publish this data regularly. The numbers for RAPS were also published earlier. But since 1979 the authorities no longer publish such information even in nuclear industry journals abroad where, a lot more useful information about the Indian nuclear programme appears then is ever published in the 'Desi' press. **The format for reporting this dose makes separate columns for regular employees and contract labour. However; except for one year, (1976when the dose at RAPS-1** was **650 man-rem for regular employees and 150 man-rem for contract workers), the Indian authorities did not publish these** figures separately, but rather gave a combined figure. This figure hovered around 800 to 900 man-rem. In 1989 Dr. A.K. De, then chairman of the Atomic Energy Regulatory Board, made an announcement in the newspapers stating that the radiation dose to **workers at RAPS** and **MAPS** was **unacceptably** high at 1700 man-rem and he had recommended that the dose be brought down to 1000 man-rem. RAPS had been ordered closed **for** a **few** days because of this. Apart from this newspaper report there has been no other reference that I have come across which gives the total radiation dose to workers. It is not clear from the newspaper report whether 1700 man-rem is the dose due to both the reactors or if it is the dose due to each reactor. I suspect the latter, since prior to 1980 RAPS consisted of only RAPS-1 reactor and a dose of about 850 man-rem had not rung any alarm bells then. Another point which is not clear at all is whether this dose is the external dose received by workers or if it includes the internal dose absorbed by workers through inhalation of tritium and other radionuclides. The Canadian data makes a distinction between these two categories of radiation doses. However, even if we give the benefit of the doubt **to RAPS, and take** 850 **man-rem as the total (internal + external) dose at each reactor, this figure is eight times as high as the dose at Pickering. The Pickering dose is 111** man-**rem per reactor. As I mentioned before the Pickering reactors** have been **in** operation **the same amount of time as RAPS and produce twenty times more electricity.**

The Survey

Some of the material in this section has appeared before in "Anumukti"(See "Anumukti" Vol.3 No.6 and Vol.5 No.4). We are including it here in the interest of completeness. However, those who have seen this before can skip this section and go directly to results. A summary of the methods is presented for convenience.

We first went to Rawatbhata in April, 1990 at the invitation of the Parmanu Pradooshan Virodhi Sangharsh Samiti, a body formed by Sarpanches of ten villages around Rawatbhata. Despite the name, this was not an antinuclear group. The invitation to us was the proverbial clutching at straws when drowning. They had originally invited us a year earlier, but had later canceled the invitation. This cancellation had been done because the RAPS (Rajasthan Atomic Power Station) authorities had promised to look into their complaints on the condition that they would cancel their invitation to anti nuclear groups to come to Rawatbhata.

Their demands were the usual demands of people with respect to development projects: When would we taste the fruits of development? They wanted jobs, schools, roads, access to medical facilities, etc. One of the points they made was the fact that even after 17 years, the village on whose land the reactors had been built, (Tamlav) had yet to receive electricity connections. (See Sunils article *Rawatbhata: Development Brings Dissatisfaction* in *Anumukti* Vol.3 No.5, April, 1990)

Our report about the visit *(Chernobhata?)* **was** published **in *Anumukti* Vol.3 No.6, June, 1990. It received a good amount of national and some international publicity. Since then, other newspapers sent reporters and photographers to the area and they have published a number of reports. A British journalist, Christopher Mitchell made a** clandestine film, "The Price of Power", which was shown on Channel-4 in Britain on April 2, 1991. Excerpts from this film along with an interview with the Secretary of the Atomic Energy Regulatory Board (AERB), Dr K.S. Parthasarathy, were shown in the September 1991 edition of "Eyewitness"—a videomagazine brought out by *Hindustan Times TV.* The release of this video caused quite a comfnotion, with questions being asked in the Parliament and the subject remaining in the news for many consecutive days.

The Basic Difficulties

For more than a year we had been trying to persuade various independent organisations with expertise in the matter to conduct a door-to-door survey of the area. We felt diffident about doing the survey ourselves since we had very little expertise and virtually no resources to undertake this task. Unfortunately no organisation came forward to do this work on their own. Some organisations, who did show an interest, wanted to submit project proposals and get approval and grants from the government before proceeding However, government approval essentially means approval from Department of Atomic Energy (DAE). The DAE has been notorious for delaying grants and approval for such surveys. For example, they delayed for five years before giving grants to South Gujarat University for making a baseline health survey of the area around the Kakrapar nuclear power plant.

At the same time there were reoeated requeste from the people around Rawatbhata which promised all possible help in carrying out the survey. At the Bangalore meeting of antinuclear groups in April 1991, (See *"Anumukti"* Vol.4 No.6) there was strong support for the idea of conducting the survey. All these things together helped us decide to do the survey ourselves.

Not having done such a survey before we were ignorant of the difficulties involved and had no inkling of the different kinds of organisational skills required Now that the survey is done, we don't mind admitting that without expert help there is a good chance that we would have made a fine mess of things but fortune favoured us and we had a very lucky break is the form of a chance meeting with Dr Leela Visaria of the Gujarat Institute for Area Planning. She not only helped in the design of the survey schedules but also sent two absolutely invaluable investigators to help conduct the survey. Shri Vinayak Dave and Ms. IIa Mehta not only taught us a good deal but also took care to see that the survey was properly conducted and no household inadvertently left out We also received expert help from a team of eight doctors from various parts of the country who came and helped with the diagnosis of serious conditions.

The second great constraint was money. We cyed with the idea of applying for .a research grant, but gave that up due to considerations of the time and effort involved. Then we had a happy thought First of all reduce expenses to the absolute burden so that no single entity gets too much of a load. It was decided that all investigators would volunteer not only their time and energy but also contribute their traveling expenses; boarding expenses would be the responsibility of our local hosts at Rampura and Rawatbhata; expenses such as publication of schedules, medicines and other equipment would be borne by the *"Anumukti"*group. We made an appeal for both volunteers and donations. The response was overwhelming and far beyond our expectations.

Methodology

Ideally, what one needs in a comparative survey are two populations which are similar in each and every respect, except as regards to the effects of the factor being studied. For a case like Rawatbhata, the best course would have been to have done a baseline survey before the plants were set up, and then to have repeated the same survey using the same methodology a few years later. This way, one could have compared the two, and if the setting up of the plant had resulted in any adverse health effects, these effects would have become apparent. Unfortunately, this course is not now open as the authorities did not do any baseline survey of the area before the plants began operation. In fact, even today new plants are being set up and the authorities have still not felt the need to do any kind of basic health survey, on the specious excuse that it is not a requirement for other hazardous industries.

The next best course is to do a comparative health survey of two similar populations. Obviously, it would not be sensible to compare the disease and deformity pattern of a population living in high rise apartments on Malabar Hill in Bombay with those of villagers around Rawatbhata, since the pattern would be different due to differences in lifestyle, genetic pool, environmental and stress factors, etc. The similarity of two populations is a difficult condition to meet, since there are so many factors which can vary between populations. The criteria used for selection are described in the following section.

Criteria for Selection

All the villages which were in the north-east direction of the plant within a ten kilometer radius were selected for the survey. We chose the north-east direction since during the monsoons, the wind direction is from the south-west towards the north-east. Logic dictates that if the routine air emissions of radioactivity from the plant were causing any adverse health effects in the surrounding area, then the effect would be most pronounced in the north-east direction, due to settling of radionuclides through rain. There were five villages in all (Tamlav, Deeppura, Malpura, Bakshpura and Jharjhani), which satisfied this criterion, with a total number of 551 houses and a population of 2860. Except for Tamlav, which lies closest to the plant, all the other villages are situated in a valley called the Kundal. Deeppura and Malpura lie just at the head of the valley, where it has narrowed down to almost a canyon, while Bakshpura and Jharjhani are further insiden the valley. There are other villages more distant from the plant or in other directions from the plant. But we did not include them in the survey for two reasons. Firstly, we had adopted the criteria of wind direction during monsoons and a distance of ten kilometers from the plant as the basis for selection and we did not want to deviate from this criterion. Secondly, to have included more villages would have meant substantially increasing the size of the population covered. That would have made the survey well beyond our capabilities.

For the sake of comparison, we chose the four villages of Khetpalia, Dhoodhlai, Anandipura and Chandrapura near Rampura in Mandsaur district of Madhya Pradesh. These four villages are more than fifty kilometers distant in the south by south-west direction. The total number of households were 472 and the population was 2544. The choice of the comparison distant villages was dictated by the fact that they were located in a very similar geographical setting — near another reservoir on the Chambal and near a small town. There was no other large industry in the neighbourhood of these 'distant' villages and the pattern of motorised vehicular transport was also very similar. Obviously, we could not have chosen the control villages much closer to RAPS, since then one would not be able to discount the effect of the plant, but neither could we choose villages much further away since then the geographical and socio-economic pattern would have been much different in the two areas.

The data that was collected provides information not only about people's health but also data like where they were born, educational status, employment, births and deaths within the last two years, pregnancy histories of all women of child-bearing age, land holdings, fertilizer and pesticide use, animal holdings, nutritional status, etc. Thus, we wanted not only to compare the health of the people in the near vicinity and those farther away, but also try to see what positive difference this giant nuclear enterprise had made to the economic status and prospects of its neighbours. We also wanted to confirm if the two populations were indeed comparable as hypothesized.

The Volunteers

Volunteers came from different parte of the country, but they all shared one quality—unbounded vigour and enthusiasm for work. It was indeed a revelation to see this kind of dedication. There was one group of 18 college students from Delhi, some of whom were post graduate students. The other large group' was students from Rampura college. There were two volunteers from Hoshangabad, and a group of eight doctors— two from Delhi, one from Gwalior and the rest from different parts of Gujarat who came for the last few days and helped by diagnosing the different ailments of the patients. Besides these volunteers, who did the actual work of data collection, there were many other local youths who helped by looking after us, bringing us food, interpreting and in various other ways.

The Nitty Gritty

Each and every household in the selected villages had to be identified first. To do this every house was numbered. Since we wanted the numbering to last for sometime in case a revisit was needed later, a small metal numbered disc was nailed to the front door of every house. Next, a volunteer wrote down the name of the head of the household and the total number of family members. A third person would at the same time draw a map of the village and place the house in the context of the map. All this had to be accomplished before any survey questions could be asked. Sometimes even this seemingly straightforward task could present unexpected difficulties. In Deeppura one day, all of un were astonished to see a group of people emerging from what looked like a field of tall corn. further enquiry revealed that We had completely missed four,'houses since they did not ha\e any visible entrance, being surrounded by fields on all sides*

The numbering had to be logically consistent and the logic had to be apparent to someone who had not participated in the numbering process. Remark ably, this was accomplished so successfully that later on some villagers approached us with a request for a copy of our list, because they said the village pa richayat numbering was inaccurate and inadequate and they would prefer to adopt our more systematic approach

For the filling of survey schedules, a team consisting of a male and female volunteer each was assigned houses according to the map. Quite often there would be nobody at home and repeated visits had to be made. We had to reach the village almost at dawn since by 7:30 a.m. most folk would leave for work. Thus, the most productive times were early mornings and late evenings. Women in the family were the more crucial contact since only they could give us details of pregnancy history. Since women are the most overworked group, having to work both in the field and at home answering our persistent and seemingly never-ending questions was an additional imposition. But they cooperated and answered all the questions with exemplary forbearance. Sometimes, especially initially, there were communication problems due to the local Mewari dialect, but luckily most local youth did follow and speak Hindi and after a few days the volunteers had picked up enough to get by.

A Typical Day

day would begin usually around 4:30 in the morning, as we had to get ready and catch a bus or hitchhike on trucks to reach the villages early enough. The house numbering, listing and map making team would start on a new village while the scheduling team would fill schedule* in previously numberd and listed area. Sometimes villagers mistook us for people who would provide them with land deeds. In these cases, the false hopes had to be removed. There were times when people refused to answer any questions. In such cases one had to explain to them what the survey was about and persuade them. At times this could be a severe test of persuasive skills. Rut finally, there wasn't a single instance where a family did not consent to answer questions.

An air of uncertainty hung regarding meals, though our hosts in Rawatbhata went to extraordinary efforts to provide us food on time. I don't think anybody ever went hungry, but lunch wasnt something you could count on.

A lot of time was spent walking long distances during repeated visits to a house whose residents had gone out for work. Vinayak had the most work, since he had to keep the whole thing coordinated, distribute new house numbers to those who were unable to locate people in their assigned houses and then keep track that no house was left out and that there was minimum duplication.

By the time we returned to Rawatbhata in the evenings, hitching a ride back on trucks, it was around 9:00 p.m., and all of us were dead tired. A bath and dinner and most of all sleep was a welcome prospect However, before one could go to bed, one had to complete anything left unfinished in the schedules and also meat together to discuss the problems encountered during the day and decide on the next day's assignments. We rarely managed to get to bed before midnight.

Initially there was some cub ture shock, since city-volunteers had previously little experience of the extrte poverty and the lack of sanitation in the villages. But the warmth with which the villagers welcomed us soon won us over and we decided to stay in the villages to avoid transportation hassles. We were treated so well that we felt like baratees' and ate some of the tastiest meals we had ever eaten.

Our best memories of the survey are connected with the truck rides back to Rawatbhata in which there was a lot of singing and some incredible feats of balancing on a fast moving truck without any kind of hand-holds. It was this spirit of bonhomie and unfailing good cheer that has established strong feelings of comradery between all of us.

The days spent at the survey counting diseases and watching stark poverty face to face and contrasting this scene with the monster development project nearby was the best possible education for the volunteers on the 'benefits' of nuclear energy. Any 'free' time was spent discussing all aspects of nuclear energy production and distribution. It was without doubt the best nuclear energy awareness camp that I have ever attended.

A Special Problem

Despite earlier fears to the contrary, there was no direct attempt by the authorities at stopping the survey. However, there were rumours and scares aplenty. Informers were a constant bother. Probably the reason there was no direct attempt at stopping the survey was the fortunately bad relationship between the RAPS bosses (their overbearing attitude hasn't made them loved) and the local administration. However, this is just speculation on our part. The RAPS authorities did succeed in forcing the local administration to take some 'action'. This action consisted in putting pressures on our local hosts, who were repeatedly harassed.

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The Last Days

After completing the work at Rawatbhata we went to work at Rampura. The work here was just as busy as Rawatbhata. but it was easier and better organised. Our local hosts had arranged for a vehicle, so getting to and fro from the field area was no longer such a hassle.

The team of Doctors from various parts of the country came near the end of the process of data collection. We wanted them to check all the serious cases which had been identified in the survey and confirm the diagnosis. The doctors not only went to every house diagnosing, they also had to distribute medicines and to listen to all kinds of complaints. The data collection process had lasted from 4th of September 1991 to 22nd of September 1991.

Data collection was just the beginning. Next came analysis. The schedules had to be put in a computer ready format. We are very grateful to the team of computer operators at Gujarat Institute of Development Research for entering the data into the computer. The process of analysis and understanding required a lot of interaction with the computer and while the computers were at Ahemdabad, we were at Vedchhi. Frequent travels to and fro took a lot out of us. Fortunately, at this stage, our appeal for the donation of a computer was answered and we were able to start analysing the data in right earnest. Another lucky break was receiving a copy of a computer programme brought out jointly by Centre for Disease Control in Atlanta and the World Health Organisation called EPI-5 which was especially useful in doing the analysis.

Summary of the Methodology

Each and every house in the survey was visited by a team of two (one male and one female) investigators, who filled the precoded schedule consisting of questions pertaining to various demographic data; economic and educational status; disease and immunisation; land and animal holdings; irrigation; pesticide and fertiliser use; employment patterns; family size; births and deaths during the last two years; pregnancy outcome of all women in the reproductive age-group; etc. Twenty percent of the households were randomly selected for additional information on dietary intake. Authenticity of the data collection was checked by random revisits by another team consisting of a demographer and a physician.

It needs to be noted that both" the proximate as well as distant' villages are rural areas of Central India far away from metropolitan centres. Any visit by a large team of 'outsiders' in such an area is a socially significant event. Although the questions were put separately by the investigators to adult male and female respondents, usually the whole family was in attendance and very much a part of the process. The investigators were thus able to see and verify for themselves any obvious case of deformity or serious illness.

In all cases where the investigators reported a deformity or a serious long term illness whether congenital or acquired, this was later confirmed and classified through clinical examination by physicians. However, no radiological or laboratory examinations were carried out.

Results

First of all, let us find out if the two selected populations are indeed comparaole. To do this, we will look at a number of parameters like age and sex distribution of the population, caste composition, educational status, diet and nutritional status, land and animal holding patterns, employment, housing, general living conditions and social habit indicators like the age of marriage and child-bearing, etc.

Age, Sex and Caste

Data regarding age and sex distribution and caste composition are presented in Tables 2 and 3 respectively. What these tables show is a pattern of similarity in both areas. The age and sex distribution show no statistical differences at all. The caste composition on the other hand does show some variation in the two areas with scheduled tribes and upper castes being a little more in the proximate villages and the backward castes being more in the distant villages. Scheduled castes percentages in both the areas are equal. An examination of the subcastes (jatis) also reveals some likeness, with the same subcastes being represented in both the areas.

Education

The educational pattern (Table 4) too shows singular uniformity. More than 70 % of the people in both areas are illiterate. The distant villages have a slightly greater proportion of people who have studied until class VII at school. In the proximate villages those who do study seem to study a little longer. It needs to be emphasised that the numbers do not show any statistically significant variation in the two areas. The sex wise differentiation of this data does not throw up any kind of variation in the pattern of the two areas.

Age Group	Proximate Villages		Distant Vlllages	
	Males	Females	Males	Females
0 — l year	63(2%)	57(2%)	43 (2%)	55(2%)
1 — 4 years	136(5%)	134 (5%)	126(5%)	122(5%)
5 —14 years	393(14%)	370(13%)	356(14%)	359(14%)
15 —24 years	284 (10%)	283 (10%)	216(8%)	222 (9%)
25 —34 years	220 (8%)	196(7%)	176(7%)	180(7%)
35 — 44 years	141 (5%)	122 (4%)	140(6%)	108 (4%)
45 — 54 years	104 (4%)	100 (3%)	79(3%)	89 (3%)
Over 55 years	150 (5%)	107 (4%)	145(6%)	128(5%)
Total	1491 (52%) 1	1369(48%)	1281 (50%)	1263 (50%)
The percentages i been rounded off	in parenthesis to the	in this and whole numb	subsequent tar.	ables have

Caste Group	Proximate Villages		Distant Villages	
	Males	Females	Males	Females
Scheduled Tribes	162 (6%)	131 (5%)	151(6%)	165(6%)
Scheduled Castes	421(15%)	371(13%)	268(11%)	263(10%)
Upper Castes	202(7%)	188(7%)	103(4%)	87(3%)
Backward Castes	703(25%)	674(24%)	755(30%)	745(29%)
Muslims	3(0%)	5(0%)	4(0%)	3(0%)
Total	1491 (52%)	1369 (48%)	1281 (60%)	1263 (50%)

Table 3: Caste Composition

Qualifications	Proximate Villages		Distant Vlllages	
	Males	Females	Males	Females
Illiterate	877(31%)	1214(42%)	681 (27%)	1118 (44%)
Up to Class 6	368(13%)	118(4%)	412 (16%)	128 (5%)
Up to Class 10	216(8%)	34(1%)	163 (7%)	17(1%)
Up to Class 12	24 (1%)	3 (0%)	16 (1%)	0 (0%)
More than Class 12	6(0%)	0(0%)	4(0%)	0(0%)

Table 4: Comparative Educational Status

Cotegory	Proximate Villages	Distant Villages
1 Energy	2474 ± 991 cal	2405 ± 784 cal
Protien	80 ± 30 gins.	79± 27gma
Carbohydrates	448 ± 159 gms	457 ±156 gms
Fate	32 ± 25 gms	27 ± 16 gms
Calcium	549±346 mg	522 ± 275 mg
Iron	38 ± 35 mg	39 ± 37 mg
Vitamin A	778 ± 698 mg	257± 1904 mg
Vitamin C	13 ± 20 mg	24 ± 34 mg

Table 5: Per Capita Dietary Intake

	Proximate Villages	Distant Villages
Family Size	5.19 ±2.66	5.39 ±2.67
Women Head of House	5.4%	5.5%
Av. Pregnancies	5.30±2.09	5.15 ±2.16
Woman's Age at:		
Effective Marriage (Gauna)	15.1 * 2.0 years	15.4 ± 2.5 years
Birth of First Child	18.4 ± 3.1 years	19.3 ± 3.2 years
Live-Birth	23.7 ± 5.7 years	24.0 ± 5.5 years
1 Abortion	23.1 ± 5.9 years	21.5 ± 5.2 years
Still-Birth	22.8 ± 7.0 years	22.0 ± 6.7 years
Birth of Deformed Child	25.2 ± 5.8 years	23.8 ± 4.9 years
Av. Number of Children Born to Women Aged 45—49 Years	6.3	7.1

Table 6: Maternity Indeces

Nutrition

Another point of striking similarity between the two areas is the diet. (Table 5) The questions regarding diet were asked to a randomly selected 20 percent sample in both the areas. The question asked related to the food intake of the previous day. Different families had naturally eaten a variety of foods and also the amounts eaten were widely different. There were families who had fasted that particular day and others who had feasted. A pattern of per capita (considering an adult male as a unit and multiplying other members of the family by appropriate factors), nutritional intake for each area was calculated using the standard nutritional tables and procedures. The results show that the average nutritional status of x>th the areas is identical We have calculated not only the average caloric intake in each area, but also the intake of proteins, fats, carbohydrates, vitamins A and C as well as minerals such as calcium and iron. The averages in both places of *the* caloric intake show that the *met* is the same as the average dian diet. There was a near total absence of green leafy vegetables and fresh fruit in the in diet of the proximate villages. This might be a seasonal phenomenon. Absence of fruits and green vegetables in proximate villages' diet accounts for the differences observed in the vitamin A and C intake. The variation in the intake within each area is far larger than the differences between the two. The differences in the vitamin intake in the two areas cannot account for the wide variation seen in the health pattern (seo below).

> Differences ob served in the health pattern cannot be due to deficiencies in diet. The mean caloric intake is the same as that of the average Indian diet.

Maternity Indices

Table 6 tabulates various indices, related to women, like average number of pregnacies., average family size, age of the women at marriage and at the birth of the first child. The average age of women at the time of miscarriages, birth of a still born child and of a deformed child are also tabulated. These numbers are uniform in both areas. The numbers are important since they show that the differences observed in untoward pregnancy outcome, especially in the case of congenital deformities, cannot be attributed to factors like differences in the age of child bearing.

Living Conditions

The housing conditions in both the areas are quite comparable. Over 80 percent of the houses are mud construction Teutons' houses and only around ten percent of the houses are brick or stone 'pukka' houses, with a permanent roof. The other ten percent in both areas come somewhere in between, with some parts built in stone and the rest in mud. The size of the houses (number of rooms) is also alike in both the areas.

However, there is a significant difference in the number of houses having electricity. Surprisingly, while only 20 percent of the houses near this 'electricity producing' atomic power plant have electricity, the percentage in the far- off villages is 52 percent.

Three fourths of the people (74.1* in proximate villages and 76.4% in distant villages) are livestock owners, mainly sheep, goats, cows, bullocks and buffaloes. In both areas the number of large cattle owners (more than 15 animals) are similar (15*). While cows are prefered in the proximate areas, buffaloes are favoured in the distant region.

Another parameter we looked at was the amount of time spent in getting drinking water and the type of water supply arrangement (Table 7). More households (66.5 %) in nearby villages get their water within a five-minute walking distance than those in far-off villages (52 *). But, at the same time, more also need to walk an hour (10.9 *) nearby than faroff (7%). Water supply arrangements (Table 7) show that while ten percent of the people get tap water, nearly two percent of house holds (all in Tamlav) still go to the pond for their drinking water (see discussion section below).

	Proximate) Villages	Distant Villages
Housing Condition		
One room	61.2*	56.1%
2 to 4 rooms	37*	41.6*
4 rooms or more	1.6*	2.3*
'Kutcha' Houses	85.3*	82.5%
Electrified Houses	19.93*	52.02*
Water Supply		
Well	59*	71.3%
Hand pump	28.6*	28.2%
Water Tap	9.8*	—
Pond	2*	—
5 Minutes Walk	66.5*	52%
15 Minutes Walk	21.4*	40.8*
1 Hours Walk	10.9*	7*

	Proximate) Villages	Distant Villages
Housing Condition		
One room	61.2%	56.1%
2 to 4 rooms	37%	41.6*
4 rooms or more	1.6%	2.3*
'Kutcha' Housee	85.3%	82.5%
Electrified Houses	19.93%	52.02*
Wote* Supply		
Weil	59*	71.3%
Hand pump	28.6*	28.2%
Water Tap	9.8*	—
Pond	2*	—
5 Minutes Walk	66.5*	52%
15 Minutes Walk	21.4*	40.8*
Hours Walk	10.9*	7*

Table 7: Housing Conditions and Water Supply

ing sets in the remote area (57% irrigated land) than around Rawatbhata (39.3% irrigated). Households in the far away villages use more fertiliser and pesticides than those near Rawatbhata. There are significantly larger number of pump set owners in distant villages (139, 29.4%) than in proximate villages (38, 6.9%). This fact too highlights the anomaly that those living near the electricity producing plant are deprived of the benefits of power.

Work Category	Proximate Village*	Distant Villages
Employer	0.5*	0.2%
Self Employed	27*	19%
Assistant	8*	12%

Labourer	13*
Salaried Employee	2*
Unemployed	1*
Housewives	9*
Students	9*
Children	27%
Retired	1.5%
Disabled	0.2%

Table 8: Employment Status

Land Holding and Agricultural Practices

The land ownership pattern shows that more households in the proximate area are land holders. While 75 percent of households nearby own some land, the number of such households in the far villages is only 66 percent. There are far mora landleas people in distant villages than in near villages. However, if we look at the amount of irrigated land the figures are reversed. There is a much higher degree of irrigation and availability of electrified pump-

Employment

The employment pattern (Table: 8) mirrors the land holding. More people (34.8% vs 31.5%) are self employed (mainly family farms) in the near villages as compared to the far villages where the number of labourers and assistants is a little larger (15% to 18.4%). Amongst the other categories we find that salaried employees and those employing others are more in near villages than in the remote onus. The absolute numbers are small in these cases. On the other hand, there are more retired people in the distant villages. Except for these small differences, there are no differences at all between the two areas with the proportionate numbers of children and students, housewives, unemployed and disabled being exactly the same.

The major difference is the proximity of RAPS. More detailed breakup of the category of labourers and salaried employees reveals that while over 99.5% of those in the distant area are employed in the village itself; in the proximate area 44% find work in the Anushakti complex. By Anushakti complex, we mean the campus consisting of operating nuclear reactors of RAPS—1 and 2, the Heavy Water Plant, and the new construction sites for RAPS—3 and 4.

Let us consider salaried employees first. Out of a total of 51 such persons, only eight have got work in RAPS and one in Heavy Water Plant. Of these nine, (all males, by the way), live were outside migrants who were not born in the area. The whole Anushakti complex—this giant development project with an investment of hundreds of crores in the past, and thousands of crores of new investment in RAPS-3 and RAPS-4—was resulted in regular salaried Jobs for just four local people in these five villages.

RAPS has provided far more work for 'casual' workers. These casual workers are not casual in the sense of being intermittent, but rather are regular workers who are employed through the agency of labour contractors. The number of these labourers varies seasonally depending upon the work available at RAPS, but during the survey half the labour force (190 out of 381) was working at Anushakti We were told that due to a slowdown in construction of Units three and four during the time of the survey, this percentage was on the low side. The need for contract workers is greatest when the construction work is proceeding normally and there is shutdown in the operating reactors (Units one and two). Contract workers are used a lot during cleaning.

Over 40% of the labourers are people who have not been born in the area. In contrast to the case of regular employees, women form a substantial proportion (over 40 percent) of the labourers. 49% of the women labourers were born outside the area and have come after marriage. However, 36% of the male contract workers are migrants from outside.

The most shocking aspect of work at RAPS is the recruitment of child labour. We found that 8% of all the contract labourers from the survey area were children under the age of 15. Boys during puberty are especially vulnerable to radioactive pollution since that is the time when their testes are maturing and any damage to the embryonic cells can have lifelong consequences in terms of untoward pregnancy outcomes. Almost all the women who work at RAPS complex are in their reproductive period. Developing fetuses especially during early pregnancy, are most vulnerable to radioactive hazards.

A Good Match

On the basis of the information given above we can confirm that both the areas are equivalent and therefore comparable. There are some significant differences, but these are not differences of lifestyle, rather are differences mainly associated with development (see section on discussion). The similarities between the two areas are striking and are in great contrast to the large differences that we observe in the disease, deformity and mortality patterns (see below).

The practice of child contract labour in nuclear plants is reprehensible. Pregnant and lactating mothers and young children should not be allowed to work within the premises. The poor are driven by poverty to seek a livelihood even in the most dangerous work. But should the authorities not bemore concerned regarding the long term consequences

Health Indicators

The first and the most conepicuous difference that one finds in the health of the two areas is that considerably more people complain of ill health in proxirhate villages and they complain about a larger number of ills. Despite this, most interestingly, a majority of the population of the proximate area said that they had no health problems at all. While 25 percent of the population in the remote villages had at least one health related complaint, the percentage of people around RAPS was 44.6%. If we look at households as a unit, we find that while there were 160 households out of 472 in far villages (Rampura area) who did not report any sickness, and 25 families all of whose members reported at least one sickness, the numbers in the case of near villages were 91 and 80 respectively (out of 551). This tendency towards greater sickness in the proximate villages becomes more apparent as we look at complainants with larger number of problems. For example, there are 68 households with at least one person complaining of four separate problems in near villages, whereas the number for the far villages is nine.

Another interesting observetion is that there are some types of complaints where no statistical differences in number of affected persons between the two areas were found..These jnclude short duration fevers, breathing difficulties and conjunctivites (see Table 9); there were no differences observed in the patients with hospital confirmed diagnoses of heart disease and diabetes. The number of such patients with confirmed hospital records (in both the areas) were very few.

In contrast, there are other types of complaints where we find huge differences between the number of affected persons. The incidence of chronic prob-

Table 9: Disease Prevalence

Typo of Slckness	Proximate Villages	Distont Villages
Short Duration Fover	137 (4.8%)	117 (4.6%)
Affected Persons	24 * 19 years	26 ± 19 years
Average Age		
Breathing Difficutties	71 (2.5%)	52 (2.0%)
Affected Persons	46 years	48 years
Average Age		
Persistant Cough	103 (3.6%)	60 (2.4%)
Affected Persons	31 * 19 years	42 ± 22 years
Average Age		
Long Duration Favors	120 (4.2%)	41 (1.6%)
Affected Persons	26 ± 17.6 years	30 * 17.5 years
Average Age		
Body Ache	126(4.4%)	23 (0.9%)
Affected Persons	34 ± 15 years	33 ± 16 years
Average Age		
Pain in Joints	116(4.1%)	5G (2.2%)
Affected Persons	43 ± 15 years	45 * 16 years
Average Age		
Digestive Problems	360(12.9%)	151 (6.0%)
Affected Persons	29 ± 18 years	33 ± 19 years
Average Age		
Weakness & Debillty	147(5.1%)	96 (3.8%)
Affected Persons	36 ± 17 years	46 ± 18 years
Average Age		
Skin Diseases	208 (7.3%)	76 (2.9%)
Affected Persons'	21 ± 19 years	21 ± 20 years
Average Age		
Solid Tumours	30(1.1%)	6 (0.2%)
Affected Persons	41 ± 21 years	60 ± 18 years
Average Age		
Eye Problems	51 (1.8%)	20 (0.8%)
Affected Persons	39 ± 21 years	42 ± 13 years
Average Age		
Conjunctiviest	16 (0.6%)	12 (0.6%)
Affected Persons	15 ± 17 years	12 a 12 years
Average Age		
Cataract	21 (0.7%)	8 (0.3%)
Affected Persons	58 ± 15 years	68 ± 7 years
Average Age		
Acquired Defromities	31 (1.1%)	17(0.7%)
Affected Persons	41 ± 15 years	48 a 18 years
Average Age		
Polio		
Affected Persons	24 (0.8%)	17 (0.7%)
Average Age	21 a 18 years	21 ± 15 years

lema like long duration fevers, long lasting and frequently recurring skin problems of • various types, eye problems, continual digestive tract problems, pain in joints and body ache, a persistent feeling of lethargy and general debility, are all two to three times higher in the proximate villages. The probability that such differences could be a coincidence (in other words without a 'causative' agent) in most cases is less than one in a thousand.

A note on Statistical Significance

There are well established statistical procedures to compare some quantity in two different populations, like for example congenital deformities in far and near villages. Essentially, one is looking for the answer to the following question: what is the probability that the difference in the observations in both areas is purely due to chance? If the probability (p) is less than 5 per cent then statisticians accept that the difference in the two observations is not due to chance but is the result of some 'cause'. Thus when we say that p is less than 0.001 for the prevalence of congenital deformities in the populations of the far and near villages, what one is saying is that the chance that this difference could be purely a coincidence is less than one in a thousand.

Detailed specific analysis of these general complaints reveals more. When general eye problems are examined, we find that while there is no difference at all in cases of conjunctivites, the incidence of cataract is almost double. Similarly, for skin problems, we found larger numbers of problems such as hyperkeratosis and hypopigmentation. A great surprise was finding four men with large keloids all over their body, none of whom had any history of injury and three of whom had worked at RAPS in the past. The largest differences were to be seen in solid tumours of various kinds. While there were 30 cases of these tumours, one of them as large as a football on the chest of a women and several were the size of tennis balls. There were only five such cases in the distant villages and none so large.

A detailed diagnoses by doctors of each complaint of each individual was a task beyond our capability. Wherever proper diagnoses was done, it provides very eloquent testimony. Nine cases of pterygium—an eye problem Associated with the growth of cornea implicating radiation (usually found in workers using welding, equipment)—were observed among children by the doctors. Since this was a condition of which (in the early stages) even the sufferers were unaware of, these would not be reported to the investigators as a complaint. While we can make no statements of statistical significance regarding pterygium, since our methodology was not refined enough to do so, this does make a case for a thorough examination by eye specialists of the incidence of this disease in the area around Rawatbhata.

Another aspect of this disease pattern is the greater susceptibility of the young in the near villages to various health problems. This is seen in a number of complaints across the board (see the average age of complainant in Table 9). We find that there are some symptoms for which there is no difference in the average age between the two areas, and others where the difference in the average ages between the two areas is as much as 12 years. Invariably we find the younger invalids to be living near the nuclear power plant. Since the variation in the ages is very great, we are not in a position to make statistically significant statements regarding age, but it is a remarkable trend.

We were not equipped to detect cancers. But we found four cancer patients in the proximate area, who had been diagnosed as such by hospitals in Kota and Udaipur and who were taking treatment. Amongst the 75 persons who had died during the last two years in this area we found that six who had done so from various kinds of cancers and whose relatives had papers of hospital admissions and treatment. In contrast we found just one person in the remote area to have papers regarding cancer treatment.

> **"Increasing radiation exposure accelerates the aging process. The wear and tear caused by radiation results in the gradual accumulation of mistakes in the body's homeostatic mechanisms."**
>
> *Dr Rosalive Bertell*
> *No Immediate Danger: Prognosis for a Radioactive Earth*

Deformity Pattern

A distinction needs to be, made between congenital deformities and deformities acquired later either through illness or accident. All the deformities, without exception, that were observed in both the areas were examined and classified by doctors.

There is no statistical difference in the number of acquired deformities in both areas. These deformities (see table 9) are due to various causes, like accidents (9 near, 7 far); blindness due to smallpox (4 : 2); Burger's disease (4 . 3); paralysis due to neuromuscular disease (3 : 1), and so on.

Deformities due to polio bear closer scrutiny. The total numbers are 24 in the proximate villages and 17 in the distant villages. These numbers in the total population of each area are not significantly different. The mean age of the polio victims in both the areas is similar. However, if we look at the age wise distribution, we find that there are larger number of young children in the proximate villages, who are polio victims.

Deformities	Proximate Villages	Distant Villages
total Population	50(44)	14(14)
Above 16 years	5(5)	**4(4)**
below **18 years**	**45(39)**	**10 (10)**
below **11 years**	38 (33)	**6(6)**
Deformity Pattern Soon In the Last Two years)		
LIVE B**ORN**		
With Deformity	16	**3**
Without Deformity	236	**194**
STILLSORN		
With Deformity	4	**0**
Without **Deformity**	2	**0**

The figures in parenthesis are the number of people. There are five cases of multiple deformities all in proximate villages, four with two deformities each and one with three. The category 'below 18 years" includes the category "below 11 years". There is an almost three to one preponderance of males over females with deformites in both areas. 31 and 20 children born during the last two years respectively in proximate and distant villages have died (see Table 12)

Table 10: Deformity Pattern

Table 10 tabulates the prevalence of congenital malformations in the population of the two areas.'The prevalence is significantly higher (p<0.0009) for proximate villages over distant villages for the total population taken as a whole. However, if one compares deformities only in 'children, the differences in the two areas become more pronounced While the relative risk for deformities is 2.8 (p<0.0009) for the total population, it increases to 3.45 (p<0 0005) for people leas than eighteen years of age (born after RAPS-1 started), and to 5.08 (p<0.0002) for children less than eleven, when the second unit commenced. It is also significantly higher amongst children in the proximate villages when compared to the adult population, even when account is made of the higher early mortality due to life-threatening congenital malformations. When we compare the number of deformities between children and adults of the proximate area itself, we find the p to be less than one in a million (0.0000001). liters Is no significant difference in congenital malformations amongst adults of the two areas or amongst adults and children of the distant villages.

Deformities of the musculoskeletal system (such as amputed hands and toes, club foot, extra fingers and webbed feet and other limb deformities) were predominant (16 in proximate villages as compared to 5 in the distant area). Other major types observed were deformities of sense organs, deaf mutism, mental retardation, deformities of ganito-urinary system, central nervous system and the digestive system. No minor deformities (skin tags, heamangiomas, birthmarks, ear tags, tongue-ties, etc.) were recorded in either area. Two families (one each in both areas) have all siblings with serious congenital squints in both eyes. But for this singular instance, all the other deformities in the proximate area are not running in families. Although there are two instances of two deformities in the same household, they are both different deformities, and the parents in all cases do not have the deformity. In all the cases of musculo-sksletel deformities in children in the proximate villages, the deformities are unilateral (one-sided). The significance of this is due to the fact that inherited (familial)

deformities are usually bilateral.

All the five cases of multiple deformities are children under the age of 18 in proximate villages. Four of them have two deformities each, while one has congenital deafness, a polycystic kidney and hydrocephalus together. ,

Pregnancy Outcomes

As noted earlier in Table 6, the age of marriage, the age at which the new bride comes to live at her husband's house ('Gauna'), the age of the mother, at the birth of the first child, average number of pregnancies, the age of childbearing mothers averaged over all pregnancies etc. are all very similar in both areas. While the number of abortions, still-births, and congenital abnormalities amongst dead and surviving children (table 11) are all much higher in proximate villages, the average age of mothers at the time of these untoward pregnancy outcomes is similar (see Table 6). In our study we have considered abortion as termination of pregnancy after eight weeks of conception. That is after two consecutive periods have been missed. Congenital deformities amongst dead children were counted only in cases where the mothers were able to describe in detail the form of the deformity in the dead child. Most of these deformed children had either been stillborn or had died within a few hours of birth. They seem to be mainly cases of neural tube defects.

Time Period	**Proximate Villages**	**Distant Villages**
Abortions		
Within Last Two Years	**27 (9.4)**	**5 (2.5)**
Between 2 and 10 Years	**35 (4.6)**	**15 (2.1)**
Between 10 and 20 Years	**15 (3.0)**	**9(2.3)**
More than 20 Years	**3 (2.5)**	**0**
Still-Births		
Within Last Two Years	**6(2.1)**	**0**
Between 2 and 10 Years	**20 (2.6)**	**6 (0.8)**
Between 10 and 20 Years	**13 (2.6)**	**5 (1.3)**
More than 20 Years	**5 (4.2)**	**1 (14)**
Bom Alive But Now Dead		
Within Last Two Years	**31 (10.8)**	**20 (9.9)**
Between 2 and 10 Years	**111(14.7)**	**118(16.6)**
Between 10 and 20 Years	**83 (16.8)**	**92 (23.2)**
More than 20 Years	**30 (25.4)**	**18 (24.3)**
Living		
Within Last Two Years	**221 (77.3)**	**177 (87.6)**
Between 2 and 10 Years	**589 (77.9)**	**572 (80.5)**
Between 10 and 20 Years	**383 (77.5)**	**290 (73.2)**
More than 20 Years	**80 (67.8)**	**55 (74.3)**

The number in parenthesis are percentages of the particular outcome in relation to other outcomes within the same time frame. For example a, 9.4 percent of the pregnancies in proximate villages during the last two resulted in abortions, 2.1 percent in still births and the rest resulted in live born children. Of these, some, representing 10.8 percent of the deliveries have already expired while the other 77.3 percent still survive.

Table 11: Pregnancy

In the survey there were separate questions regarding births during the last two years. Since our survey depended on people's recall of events, the last two year's numbers are likely to be more reliable as compared to those of earlier years. During the two years previous to the survey, there were 20 babies born with some kind of deformity in the proximate area. In contrast, there were only three such babies in the distant area. Of the 20, four were still born while 16 were liveborn but nine of them had died by the time of the survey and there were seven children who were still alive. Table 13 lists 10 deaths due to congenital abnormalities but' that includes one boy who had been born with deformity more than two years ago, but who had died within the last two years.

In the distant villages, of the three children born

Time Perlod	Proximate Villag	
Abortions		
Within Last Two Years	27 (9.4)	
Between 2 and 10 Years	35 (4.6)	
Between 10 and 20 Years	15 (3.0)	
More than 20 Years	3 (2.5)	
Still-Births		
Within Last Two Years	6(2.1)	
Between 2 and 10 Years	20 (2.6)	
Between 10 and 20 Years	13 (2.6)	
More than 20 Years	5 (4.2)	
Bom Alive But Now Dead		
Within Last Two Years	31 (10.8)	
Between 2 and 10 Years	111(14.7)	118(16.6)
Between 10 and 20 Years	83 (16.8)	92 (23.2)
More than 20 Years	30 (25.4)	18 (24.3)
Living		
Within Last Two Years	221 (77.3)	177 (87.6)
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deformity during the last two years, two were alive while one had died. We made a separate calculation for the mean age of mothers of deformed children born during the last two years. The average age of such mothers in proximate area was 27.6 years and it was 22.7 years in the distant villages. Four such mothers were more than 35 years of age (all less than 40) while pone was younger than 19. Of the three mothers in the distant villages, one was 16, another 22 and the third was 30. It is known that the chances of bearing a deformed baby are higher if the mother is either very young or very old. These numbers indicate that this cannot be an explanation for the observed differences in deformities amongst children.

Abortions and still births were also seen to be far higher in proximate villages during the last two years. It might be argued that these numbers are 'unverifiable'. But there is strong circumstancial evidence which reinforces this finding. There are significantly larger number of issue-less couples (couples who have been married for at least four years, have been trying to have children and have either never conceived (23 vs 13) or have not given birth to a live baby due to repeated abortions and stillbirths (13 vs 2) in the proximate area.

Age specific fertility rates and age specific marital fertility rates were calculated for both the areas based on pregnancy histories of women of reproductive age. These numbers are in good agreement with those from census data for the area. Although we made all efforts to contact each and *every* eligible woman, we did miss a few (nearly 16 percent in both areas) sines they were not available, being away from the area during the time of the survey.

Crude Birth Rate 44.1 (34.3)	38.7 (38.7)
Gross Fertility Rate 193	179
Age Specific Fertility Rata Age Group Proximate Villages	Distant Villages
15 — 19 68(71) 20 — 24 330(254) 25 — 29 347 (267) 30 — 34 263(213)	50(88) 318 (262) 359 (252) 171(177) 123(119) 26 (62) 57(21)
1 The numbers in parenthesis are fertility rates for Chittorgarh 1 1 and Mandsaur districts in Rajasthan and Madhya Pradesh 1	
1 The gross fertility rate has been calculated per thousand 1 1 women of reproductive age. 1	

Table 12: Fertility Indicators

Untoward pregnancy outcomes are significantly greater near the nuclear power plant. The number of people complaining of sterility is greater. Abortions and still births are far larger. The number of babies who die within a few hours of birth is much larger. More congenitally deformed babies are born. These huge differences cannot be explained away by pointing to unsanitary living conditions. Neither can these differences be attributed to differences in the ages of child-bearing mothers, which are similar.

Mortality

It may be he shall take my hand
And lead me to his dark land
Close my eyes and quench my breath,
For I have a rendezvous with death.

76 persons died in the proximate area during the two years previous to the survey. The equivalent number in the case of the distant villages was 59. Since the population of the proximate area was 2860 as compared to 2544 in the distant Area, these numbers at first sight do not appear to be alarming. But the moment we do a break up of these numbers in terms of causes of death, and also in terms of age at death, these numbers tell a very different and a frightening tale. The difference in the average age of the deceased in the two areas is 11 years. People are dying younger in the proximate area.

Although these differences in the mean ages of people dying are dramatic, since the variation is very large, they are not statistically significant. To demonstrate statistical significance in mortality numbers would need a much larger sample size. But the numbers do demonstrate a trend, and it would not be difficult for any agency like the census bureau to conduct a larger survey and compare the results with those for other comparable parts of rural Rajas than and Madhya Pradesh.

Let us first consider neonatal mortality. That is those newborn babies who died within first four weeks of birth. There were 16 such babies in the proximate area and eight in the distant area. But we find a very high proportion (7 out of 16) of early neonatal deaths in the proximate villages to have taken place within one day of birth.

Cause s of Death in Children **(Aged <5 Years)**

Cause • of Death	**Proximate Villages**	**Distant Villages**
Fevers	3	7
Diarrhoea	6	**3**
Tetanus	1	**6**
Respiratory Infection	1	**3**
Measles	1	**0**
Polio	1	**1**
Congenital Defects	10	**1**
Small Baby	10	**1**
Unknown Causes	3	**1**

Causes of Death in Adults **(Aged** > Five Years)

Cause • of Death	**Proximate Villages**	**Distant Villages**
Fever	11	**9**
Respiratory Problems	5	**6**
Diarrhoea	5	**6**
Old Age	8	**14**
Pain Abdomen	2	**1**
Paralysis	2	**2**
Accidents	1	**2**
Perinatal **Deaths**	2	**0**
Cancers	6	**2**
Unknown Causes	0	**3**

Table 13: Causes of Death

	Proximate Villages	**Distant Vlllages**
Stillbirths	6 (1.9)	**0 (1.5)**
One Day Deaths	7	**1**
Early Neonatal Deaths	13 (8.2)	**5 (8.5)**
Infant Mortality	**32 (28.2)**	**19** (22.6)

The numbers without parentheses are the actual observations. The number in parentheses are those expected on the basis of census data for Rajasthan and Madhya Pradesh.

Table 14: Deaths Amongst Infants During the Last Two Years

There was just one such case in the distant villages. If we exclude these one day deaths, then there is hardly any (half a day's difference) between the average ages at death, of the neonates.

An examination of the causes of death amongst children less than five (Table 13), shows that infections, fevers, tetanus, are the predominant causes in the distant area, but that is not the case in the proximate area, where, congenital deformities, small size of the baby and diarroea are more common.

We find a contrast in the causes of death in adults as well. The number of patients who succumbed to cancer is far too high in the proximate area. We have only counted those in this category, whose relatives were able to show us hospital papers which certified cancer.

Age Group	Proximate Villages	Distant Villages
0—4 years	47.4	36. 1
	5.5	3.5
15—24 years	3.5	0
25—34 years	2.4	4.2
35—44 years	8.5	2.0
45—54 years	7.3	3.0
More than 55 years	23.3	33.0

Table 15: Age Specific Death Rates

Another difference that we observed was that two cases of maternal mortality were observed in the proximate area. None was seen in the distant villages.

The numbers in parenthesis in Table 12 were calculated from the census data for Madhya Pradesh and Rajas than for 1987. Analysing the census data over the last two decades, we find a steady decline in all mortality indicators, including the stillbirth rate. Our observation of zero stillbirths during the last two years in the distant villages is within the range of statistical fluctuation. The observation of six stillbirths in proximate villages is significantly higher.

Limitations of the Survey

The survey does suffer from a number of limitations which should be kept in mind while evaluating the results. These limitations need to be overcome in any future research project.

As discussed in the methodology, we started with a hypothesis that the wind especially during the monsoons, was the main carrier of radioactive effluents from the plant to the surrounding population. The reason for favouring this hypothesis was that during the monsoon months the wind velocity is generally high and so is the precipitation. As a result, the "routine emissions'[9] from the plant are likely to get carried to the nearby villages over the hills and then get precipitated there. Once these radionuclides get deposited in the soil they are likely to get into the food chain and since a lot of the food produced in this area is also consumed locally these radionuclides would have an adverse effect on the health of the local residents. However, during the survey we found that there were many other equally likely pathways which could perform the task of transporting radioactive waste from the plant premises to the local population. One important alternative pathway for example is due to the fact that a lot of people in the nearby villages work as casual labourers in the plant premises and hence are getting directly exposed. Since the villages we have chosen near the plant all lie in a cluster in the north east direction, they do not constitute a representative random sample of all the people living in the ten kilometre vicinity of the plant. There have been a number of anecdotal reports regarding deformities and tumours and diagnosed cases of cancer amongst the people in these other villages as well as the township of Rawatbhata. In fact, we too have come across a number of such cases in villages other than the survey villages. Thus, though this survey does unambiguously indicate something drastically wrong in the area around north- east of Rawatbhata, a more complete study taking a statistically proper sample of all the population around the plant still needs to be done. In fact, the possibility of different pathways for radioactive pollution to reach the local population makes us suspect that what we have seen in the survey is just the tip of the iceberg and a more comprehensive survey would detect far larger number of sick and deformed people especially children who would need special care from the society at large.

A major flaw in our methodology was that the questions we asked the respondents regarding employment, were related to their present status of work. There were no questions regarding past employment. Thus, our survey is not able to distinguish between those who have never worked in the RAPS complex and those who have worked there in the past but were not working at the site at the time of the survey. Since casual employment is strongly dependent on a lot of factors including the seasonal need for agricultural labour, and the status of the plant operation, the actual number of people who do work at the plant can vary greatly from time to time. Thus our finding that over 26% of households have at least one member working in the plant complex, is just a 'reading[1] and not an annual average. There could be many more or less number of people who might have been going to do work in RAPS at different times. There were also no questions to distinguish between those whose work would take them inside the plant proper and regarding the kind of work they did there, and others whose work might not have involved going inside the plant but was confined to the premises of the plant This is an especially serious shortcoming since we are not able to say anything about the employment of parents of congenitally deformed children at the time the children were born.

We stated before that the Rawatbhata area is devoid of other industries and vehicular traffic so that there are no confounding factors. However, this statemeat needs to be qualified. There is one other large plant in the area and that is the Heavy Water Plant run by the Department of Atomic Energy. This plant uses a process which involves the use of large quantities of hydrogen sulfide gas and sulphur dioxide gas. There have been leaks of these gases to the environment in previous years, and during the survey many people even as far away as ten kilometres from the plant told us about the strong smell of rotten eggs which made life almost impossible at times. The synergistic effects of radiation and chemical pollutants are as yet not very well understood but there is no doubt that this can be an additional factor in the poor condition of the health in proximate villages.

Many people work as casual labourers in the heavy water plant as well. The heavy water plant acts not only as a production unit of fresh heavy water but also as a unit which refreshes degraded used heavy water. This latter kind of heavy water is radioactive and the casual workers do receive an occupational dose. This dose consists of not only external radiation but also more importantly workers inhale radioactive tritium and hence receive an internal dose.

Casual workers pro'vide a true cross section of the weaker sections of our society. Studies on them would be of great relevance to a majority of the population.

Studies of radiation and nuclear industry workers all over the world have been bedevilled due to what has been called "the healthy worker effect". This pertains to the fact that while the carcinogenic effect of radiation is well established in a very large number of studies, radiation workers by and large show less number of cancers than the average population at large. As has been pointed out by Dr Alice Stewart amongst others, this dearth is due to the fact that nuclear industry workers are amongst the well to do section of the society, and they are chosen for the job after medical examinations which would eliminate weaker subjects. The casual workers on the other hand do provide a real and representative cross section of the weaker sections of our society and therefore results of studies undertaken on them would be of far greater relevance to a majority of the population.

A major deficiency of the study is the absence of any observation regarding radiation levels. Therefore, it is not possible for us to make a clear claim that radiation from RAPP is the cause of the poor health and the high number of deformities seen in the neighbourhood. What we can say from this epidemiological survey is that the health status of the people is unusually bad and this deterioration cannot be facilely attributed to poverty ignorance or unhygenic living conditions. Radiation can be a likely cause, and the pattern of disease and deformity does show similarity with other patterns seen elsewhere in the world where too radiation has been involved.

Another deficiency of this study is the absence of laboratory backup. Nowadays, with the advance of cytological techniques it is possible to undertake analysis of chromosomal aberrations of people and do what is called biological dosimetry". By this procedure it is conceivable to make a very food estimate of the radiation dose received by the subject in the past. This needs to be done and the results should be compared with the estimate* of the radiation dose produced by the environmental survey laboratories of the Department of Atomic Energy. This procedure can supplement radiation measurements and both together can be a very good indication of the damage being caused by radiation from RAPS.

1993

Discussion

During the three years after the first newt reports regarding the puzzling health condition of the people in the vicinity of RAPS appeared, there have been a number of denials and explanations offered by the nuclear establishment and the government authorities. A previous issue of Anumukti (Vol.6 No.2), in the article entitled "Lies, Damned Lies and Nucleocratic Explanations", we discussed these explanations at length. In this section, we shall discuss the results presented earlier and speculate on the various factors that might be contributory causes to the observed health effects. In the course of this discussion we will also comment on some of the various official explanations.

Disease Pattern

Reality' of the Health Effects

The survey clearly and unambiguously indicates that the health status of the people living in the proximate area is definitely worse than that of people living in the far-off villages. This conclusion is so obvious that normally we would not mention it separately. We are doing so because official spokesmen have tried to suggest that -people's health is not being affected.

"These reports are uninformed and in some cases part of a campaign to stop India from pureuing its nuclear research and power generation."

Atomic Energy Commotion Chariman
Dr. P. K. Iyengar *Hindustan* Times
179 1991

"These reports are based on conjectures and have no basis whatsoever. "

Or D.V.Goprnath, Director. Health.
Safety and Environment Group at
Bhobno Atomic Reseerch Centre
Hindustan Times 179 1991

"The stories regarding radiation malaffects on the population near RAPS are totally imaginary and facts being mentioned do not have even a distant relation to reality. Some highly placed RAPS officials maintain that villagers are "trying to blackmail RAPS". "These people think that through such adverse propaganda they can force RAPS to provide them with more* ***employment and free medical facilities. "***

Pothik Guho
reporting in *The* refegrapn

It is a strange mentality which considers popular demands for a share in the fruits' of development as an effort at blackmail . However, let us pass over this point. The results of the survey clearly show that the authorities have bean far too quick in dismissing earlier reports. They have made unsupported assertions without checking the facts. There can be no dispute regard -ing the existence of adverse health effects in the proximate region.

Radiation Related?

Two separata questions form the crux of the problem. Can a hypothesis of radiation as a causative factor account for the type and the amount of differences seen in the total pattern of disease and deformities? The other question is, whether there is any possible pathway for radiation and radioactive nuclides produced in RAPS to reach the nearby villagers?

The health implications of Hiroshima studies, according to nucleocrate are an increase in leukaemia and in certain types of cancers. This, according to them is the only radiation related health effect at low levels.

We have previously, ("Lies, Damned Lies and Nucleocratic Explanations in *Anumukti* Vol.5 No.2) discussed the falsity of this claim. Let us consider the implications of starting with such a mind-set.

Cancers and leukaemia though they do occur 'naturally', are extremely rare events. To And excess cancers, over and above their natural occurrence, would require health monitoring of large papulations. Since nuclear power plants are deliberately sited in sparsely populated area, the monitoring has to be carried out over a wide area. It becomes extremely difficult to find another such sparsely populated area with similar characteristics to act as 'control' and to separate out effects due to other environmental pollutants and arrive at any meaningful result. Therefore, an acceptance of cancer and leukaemia as the only radiation related health effect, makes it very difficult to find any nuclear plant, however dirty and polluting, to be the 'cause' of health problems in a neighbouring population.

"Cancer is nothing new to this region. In recent times cancer incidence has shown an increase all over, even in regions far away from nuclear power plants."

Dleep Shotta - on engineer ot RAPS in
Janonayak. I4,10,91

It is no wonder that with such a mind-set, expert committees appointed by the Government of Rajasthan, failed to find any evidence of "radiation-related" health effects in the villages around Rawatbhata by looking at a few people in Jharjhani, as reported by the honourable Minister of State for Science and

Technology, Shri P. R. Kumaramangalam, to the Parliament on July 29, 1992.

Moat objectionable feature of the 'survey' conducted by these expert committees was the fact that they have not bothered to publish the findings but have instead submitted a confidential report to the government. While doing this may be acceptable bureaucratic procedure, it is totally contrary to the spirit of scientific enquiry.

Shri R. Ramachandran is the science editor of *The Economic Times.* In the article entitled, "Who is Right About RAPS", *(Economic Times* 27.10.1991) he has articulated the pro nuclear position regarding RAPS. Since this article has been reprinted in full in *Nuclear India,* one can presume that the views expressed have official approval.

'There is absolutely no evidence of radiation, in any dose, leading to polio-like deformities."

This statement by Shri Ramachandran insinuates two things. One, that most of the deformities seen in the vicinity of RAPS are caused by polio; second, that-whatever is seen could not be due to RAPS since radiation does not cause polio. As can be seen from Table 9 and table 10 polio victims are not a preponderant majority amongst the deformed in either area. The prevalence of polio is not significantly different in both areas while that of congenital deformities certainly is. Radiation may not be the 'cause' of polio, but it is well known that radiation adversely affects the immune system and thus reduces the power of the body to combat disease. This phenomena of reduced immune response after radiation exposure has been seen most dramatically in Kazakhstan and in areas of Belaruss adjoining Chernobyl, where people especially children have become victims to a whole host of diseases. A new term —"atomic AIDS" has been coined to describe it.

> ***The general public has been given the impression that exposure to radiation involves a slight risk of dying of cancer and that one's chances of escaping this are better than the chances of escaping an automobile accident, Theprobabilities of early occurrence of heart disease, diabetes mellitus, arthritis, asthma or severe allergies - all resulting in a prolonged state of ill health - are never mentioned. Most people are unaware of the fact that ionising radiation can cause spontaneous abortions, stillbirths, infant deaths, asthmas, severe allergies, depressed immune systems (with greater risk of bacterial and viral infections), leukaemia, - solid tumours, birth defects, or mental and physical retardation in children.***
>
> ***Dr Rosalie Bertell***
> ***No Immediate Danger: Prognosis for a Radioactive Earth***

Although the prevalence of polio as well as the mean age of polio victims in both areas is similar (0.8% of the population in the proximate area verses 0.7% in the distant area) and 21 years in either case respectively, there are some differences. If we consider only children (<18 years), we find that the number of victims in proximate area (16), to be double that in the distant area (eight). Since there are a lot of other factors like the effectiveness of the polio immunisation programme involved in the incidence of the disease, it is not possible to make any definitive statement regarding it, based on these numbers.

Radiation Pathway

The argument of the nuclear lobby has focussed on the improbability of radiation in appreciable quantities reaching the people. The argument has been couched in the form of a counter-question. If the operation of RAPS is responsible for the health effects seen in the vicinity, then why have, these effects not been seen amongst RAPS' employees?

*"If the main mischief maker is RAPS, then why are the children of t/ie plant workers not deformed? I (Chief Superintendent of RAPS, Dr Ramanan) have worked at the Madras Atomic Power Plant for 14 years and at Tarapur for nine years, before I came here a few months ago. Logically I am receiving much more radiation sitting on my chair here than a villager at Jharjhani or Tamlav, ,[3] but am 1 affected? "*3

"The reported health problems in a few villages around RAPS have not been evident beyond natural incidence in the plant workers or their families living in the adjacent plant township. It was to be noted that the limits for radiation exposure for occupational workers was 60 times that recommended for the public"

Mr. S.L. Kotl, Managing Director,
Nuclear Power Corporation
Finonocial *£xpress* 21.11. 1 991

There are a number of hidden assumptions in a statement like that of Dr. Ramanan'e, some of these assumDtions are not al-

ways valid; some are outright false. But it is a statement that is often repeated by many in the nuclear establishment and it seems to impress the gullible members of the public, so let us consider it.

The response of a biological system to radiation is variable. Different people receiving the same dose, may show different effects. Apart from acute radiation disease (observed at extremely high doses in, for example, the firefighters at Chernobyl), there is no specific 'marked' disease caused by radiation. Low level radiation does not produce a low level radiation disease[9]. One of the things low level radiation does is that it makes people more prone to a whole host of 'naturally' occurring diseases. It increases the risk of ill health in the affected population. If a particular individual develops a specific disease that fact is not considered proof that the disease was 'due' to radiation; similarly, the fact that a particular individual hasn't developed any disease does not mean that radiation at that or less than that level is harmless. Scientists working in the field are well aware of the stochastic nature of radiation effects and yet nucleocrats will miss no opportunity to misinforfa the public by making such misleading comments to interviewers from mass circulation media.

> *I used to work in Waste Management. Once, I received a dose of 2,200 mrem in half an hour. Others have been laid off after getting a dose of 800—1,100 mrem. Most workers get this much dose in six to ten days of work. One needs to work for just half an hour to one hour every day. You receive more exposure during shut-downs. The work involves moving material. Machines are used for heavy loads, but if the load can be lifted by one or two persons, then machines are not used. My lungs have become bad. I don 't smoke. I have gone to many different hospitals for treatment. They treat you for T.B. After a few days, the doctor tell you to stop taking the drugs. Then, they restart the treatment all over again. I have developed these burn-like red marks (keloids) all over my body. One of my mates in the plant, suffers from exactly the same problem. I have a seven year old son. He was born with a sternal deformity. Ever since birth his rectum comes out when he shits (rectal prolapse). Despite knowing the dangers of working in the plant, people go there because they get better wages. If I have to starve, I will starve, but I will not work at RAPS.*
>
> Manohar Singh
> local ledent

The other assumption in the quotation above is that the regular RAPS workers are receiving larger radia'tion doses than the people living in the nearby surveyed villages. Whether this assumption is true or not depends on a number of factors. Regular workers are not a monolithic block of people all going inside the radiation fields in the reactor complex everyday. Workers consist of all kinds: operators, mechanics, security men, typists, public relation officers, station superintendents, etc. Some do receive radiation doses, some don't. Similarly, the category "villagers" does not consist only of people who have never seen the inside of the nuclear power plant. In fact there are a few regular employees of the plant (storekeepers, drivers and such like), who do stay in the survey area. Besides these 'lucky' few, there are a large number who are casual labourers, many of who go to work in the reactor complex every day.

It is unfortunate but true that in India largely illiterate, untrained, poorly paid (in comparative terms) casual labourers, have to do some of the most dangerous and dirty jobs. This is not unique to nuclear industry. This applies to a lot of other industrial enterprises as well. These casual worker* do not get any advantages like job security, medical facilities, special schooling facilities for children, etc., that are enjoyed by regular nuclear workers. All, these poor people get is a better daily wage than is possible doing an unskilled job outside. Nonetheless, as far as their radioactive dose limits are concerned, they are considered nuclear workers. During the survey we came across a number of casual worker who told us that they had received doses of 2,200 mrem within a few hours at a time; then they had been laid off. None of the casual workers who talked to us said that their urine had been examined after work in the radiation field for internal (tritium) exposure. Even the regular workers said that urine examination was not n regular feature after work in the radiation areas. Some had undergone medical checkups once a year during which their urine had been examined. We suspect that the amount of internal dose to any category of workers is not known very accurately by anybody. Casual workers also mentioned to us that often they were not even monitored for external radiation while working in the radiation field. Their Thermo Luminescence Dosimeter (TLD) batches are removed beforehand and kept by the contrac tor for 'safe custody'. Therefore, Dr Ramanan's assertion that he or other regular workers get a greater dose than a nearby Villager[1] is not universally true. Only a proper dosimetry of all the workers, regular and casual, working in the plant premises and meticulous record maintenance can decide this question.

The case with the workers' health records is similar. It is a fact that RAPS authorities take no responsibility at all for the health of their daily 'casual' workers. For health monitoring purposes, such workers are considered members of **the** general public, and hence no records of any kind are kept. On the other hand, when the question is one of receiving radiation doses, these workers are considered as nuclear workers and can receive radiation doses up to fifty times the 'permissible limit' of 100 millirems per year for the general population. Although the International Council for Radiological Protection had recommended more than two years ago to reduce the permitted dose to nuclear workers from 5,000 millirems to 2,000 millirems per year, this recommendation has still not beerenforced in India.

The health records of the regular workers, if maintained are not open to outtside scrutiny. One wonders whether any long term health monitoring of the families of regular workers is ever done. The assertion that regular workers or their families living in various colonies of RAPS at Rawatbhata, "do not show any effects beyond natural incidence", is totally unsupported. The fact is nobody knows whether they do or they don't since no scientific survey has been done to establish the truth. It needs to be emphasised that such a survey would have to be scientific, and would have to compare like with like, not the well fed, well-cared for nuclear employees with the general population. Most importantly, all the results of such a survey should be published and be open for possible criticism of the methodology. During our stay in Rawatbhata, we gathered enough anecdotal evidence to suggest that such a survey would indeed be worthwhile. It would be of immense benefit to the nuclear workers themselves, since they would get a clearer idea of the kind of price they have paid for their comfortable lifestyle working in this 'high-tech' industry.

> *"I have myself seen—and reported in 1978, without being contradicted—that employees of the RAPS would work on maintenance jobs in the reactor building where the levelg of concentration of tritium exceed 300 times the permissible amount."*
>
> Praful Bidwal

Geography may also be a factor responsible for the health differences, if any, between people living in Rawatbhata township and those living in the villages of the survey area. There are different pathways for radiological contamination in the region. The Colonies of Rawatbhata township lie some four to eight km north of the reactors. The survey villages are the same distance north-east of the plant. The river Chambal flows northwards. It is likely that while routine releases to air from the plant would be a greater concern in the villages, since the wind direction during the monsoons is towards the north-east, the releases to water would affect Rawatbhata mere. Some nucleocrats have publicly taken the totally ridiculous position that there is no possible pathway for radiation to reach the public, since there are no releases at all. In fact according to Dr K.S. Parthasarathy, the secretary of the Atomic Energy Regulatory Board:

"None of the two hundred and fifty shutdowns of the reactors has caused any radiation exposure to the public. Leakages do happen as in any industrial plant. Every drop of heavy water is collected. Heavy water costs several thousand Rupees a kilogram. All leaks are contained ."

This is so preposterous a statement that it takes one's breath away through sheer brazenness. The fact that the person who made it is a senior functionary of the Atomic Energy Regulatory Board makes one shudder. Suffice it is to add that in fact the amount of heavy water lost despite all attempts at recovery, runs to more than 26 tonnes every year, according to the Prasad Committee's report. During reactor operation heavy water in the reactor gets 'tritiated'. The deutrons (the heavier non-radioactive form of hydrogen) absorbs neutrons and some of it gets converted to tritium, which is a radioactive form of hydrogen. Over a period of time, this radioactivity accumulates and if there is any release of tritiated water vapour to air or to water this radioactivity finds its way into the environment As can be seen from Table 1, there is a substantial routine release of radioactivity in the form of tritium and argon-41 to the environment from the plant. Besides these "routine releases" to air, there are releases of radioactivity to water. The disposal of "low- level" solid nuclear wastes in the vicinity, also can (if one is not careful) contribute to the contamination of drinking water supplies. Even while admitting the fact that there is release of radioactivity into the environment, nucleocrats have claimed that the radiation dose received by the most exposed people is negligible compared to the natural background radioactivity. They also claim that this dose has not shown an increase over the years.

"Environmental Survey Laboratory has been in operation over the past 19 years. Radiation surveys as well as collection and qnalysis of 2,500 samples a year of water, soil, food, cur and various other products, has been carried out in an area of about 30 km radius around the plant. The average annual radiation dose computed on the basis of actual air and water route releases over the past 17 years has been less than 5.5 mrem per annum, except 1988 and 1990, when it was about 8 and 12 mrem per annum respectively."

Mr. S L Kotl. Managing Director. Nuclear Power Corporation *Finanacial Express2)* 11 1991

'T/ie *totat radioactivity exposure from ail routes, external as well as internal by way of food etc., received by an individual in the RAPS environment has been around 1-1.7. mrem per year. The total background radiation in the area is around 81 mrem per year and the exposure limit for the general public set by international regulaioiy bodies is 100 mrem per year.*"

Or D.V.Gopinofh. Director, Health. 'Safety and Environment Group at Bhabha Atomic Research Centre *Hindustan Times* 17 9 1991

The numbers in these two quotations, both from high ranking nicleocrats, vary so much that one doesn't know which figure to believe. These two statements may be dismissed as "being news releases and not meant for **a scientific audience. But the same confusion holds true for 'scientific[1] publications as can be seen from Table 1 for tritium releases and the tritium measurements in air. The numbers just do not tally. The validity of the measurements carried out by the Environmental Survey Laboratory is thereby called into question.**

***let* us see now if the observed disease pattern could be due to other environmental factors.**

Malnutrition

The questions regarding diet were asked to every fifth house- . hold. These households were randomly selected. The results show that the nutritional status of both the areas is exactly the same. The average caloric intake shows no difference and the variation in both places is similar. The average caloric intake in both places is the same as the caloric intake in an average Indian diet. The fact that the average caloric intake in both places is similar and the value is alike to that obtained by other surveys shows two things. First, it shows that our methodology is not erroneous and secondly, it rules out the possibility that malnutrition could be the cause of the health effects. Some cases of undernourishment (especially amongst children) were seen, but they were seen in both areas. It has been suggested that severe malnourishment could be the cause of higher abortion and still birth rates. The results of the survey do not support this theory.

Other Industrial Pollutants

There is no large industry anywhere in the vicinity except the atomic power plant and the heavy water plant. Both are run by the Department of Atomic Energy. In the distant region there is no large industry of any kind at all. There is no a priori reason to expect other (that is non atomic energy related) industrial pollutants to be the cause of the observed health effects.

Pesticides and Fertilizers

Large scale use of pesticides and fertilizers can be a cause of genetic deformities. However, the survey found that irrigated land and consequently, the use of pesticides and fertilizers, was greater in the distant villages, than in the villages near RAPS. Thus, any affect on this account would be in the opposite direction to what is observed.

Smoking

There were no questions in the survey questionnaire regarding smoking habits. However, if differences in smoking habits had been a significant factor, we would expect to see differences in breathing related problems, such as bronchitis, asthma, emphysema, lung cancer and the like. We did not see any such difference between the two areas.

Bacterial Contamination of the Water Supplies

"If the poor health conditions of the people reflects anything it is the dismal living, particularly sanitary conditions and near absence of any health care system. For example, the coliform count—as collected by the state government authoritie-of the water that is generally consumed by the village population is in thousands and tens of thousands when potable water should have near zero count. The bacteria levels are also very high. These can be the cause of general poor health conditions making them highly vulnerable to a whole lot of infectious and other diseases."

R Romachondion, ' Who is Right About RAPS", Economic Times 27 10 1991

Table: 16
(Central Water Commission)

Site	Coli-form /100ml	Bacteria/ml
RAPS	9	2
Tarm lav well	>2400	150
Tamlav pond	>24,000	320
Deeppura well	240	20
Jharjhani well 1	1100	40
Jharjhani well 2	240	95
Jharjhani well 3	>2400	170
Pump	23	10

The pattern of diseases that we observe does not support the hypothesis that water borne infections are the main cause of the health problems. If this hypothesis were true, one would expect to see not only differences in long term chronic cases of gastrointestinal tract, which we do observe; but also differences in acute infections like diarrhea, short duration fevers, conjunctivitis, urinary infections etc. We do not observe any such differences. Chronic eye problems are much higher in the nearby villages. Problems like cataract, pterygium, etc. are unrelated to bacterial contamination of water and we would not expect to see higher levels of these in nearby villages as observed, if waterborne infections were the only cause. Similar is the case with solid tumours; they are not known to be caused by bacterial infection. We observe a very large difference in solid tumours in nearby villages. The same is true with congenital deformities and cancers. In the latter case, our procedure was not capable of detecting cancer cases; we only recorded those who had been diagnosed as cancer patients by hospitals and who had the papers. Although there was a large difference in the two areas in the number of diagnosed cancer cases, it may be argued that the villagers suffering from cancer in the distant villages have not got themselves diagnosed. This is unlikely, since we found that residents of both the areas were going to doctors and hospitals for chronic ailments; in fact the villagers in the distant area found it easier to get to Rampura and 'proper' medical attention than those in the proximate villages.

More than 38 percent of the population of the proximate villages get their drinking water either from the tap (see Table 7) or from hand-pumps. Construction work is presently going on in the Anushakti complex on RAPP-3 and RAPP-4. The skilled migrant construction workers who live in a colony near Tamlav demanded a better source of drinking water than those available. It was due to these reasons that a tap water supplies were provided since last two years. These supplies are comparatively uncontaminated. If bacterial contamination were the main cause of the observed disease pattern, one would expect a far smaller number of health related problems in those households using these /supplies as compared to other households in the same villages using far more contaminated sources of water. We do not find any such correlation.

The general state of sanitation in both the areas is similar. This is a somewhat subjective assessment, but there is some tangible evidence in support of this conclusion. If we look at the pattern of infant mortality in the last two years, we find that there is a large difference in the number of still-births and one day neonatal deaths. There is no difference in the numbers of children who have survived the first day but who died within the first ten days. There can be many factors responsible for the difference in one day mortality, including the quality of obstretic care and genetic factors. Later mortality is more dependent on environmental factors like cleanliness and possibility of infections like tetanus etc. The lack of differences in these mortality rates lends weight to our subjective assessment that both areas were equally clean/dirty.

The high incidence of chronic gastro-intestinal tract infections that we observe in nearby villages, could of course be possibly due to the unsanitary condition of drinking water. This may also be a factor in the unusually high skin problems. One needs to add a caveat that a detailed breakup of different skin problems would not totally support this contention since we observed much higher numbers of people suffering from hyperkeratosis and hypopigmentation in proximate villages as compared to the distant villages. Water borne infections are an unlikely cause of these problems. Similarly, we found four men in the proximate area whose whole bodies were covered with large keloids. Keloids are not unusual in case of injury or puncture of the skin. Yet, all the four gave no history of iryury. They maintained that their condition had started as a small (pea sized) lesion and had grown to its present gigantic size. There were no such cases in the distant villages and this condition is again unlikely to have been caused by water borne infections. Since we do not have readings of the bacterial and coliform counts in drinking water in the distant villages, it is not possible for us to make any categorical statement regarding the role of drinking water in the pattern of disease. In fact, for all one knows the water quality in the far off villages may be equally bad, and the Rawatbhata readings are just the 'normal' for rural parts of central India. One finds that civil health authorities have known about the 'undrinkability' of water supplies in the proximate area for years, but have remained unmoved. Is bacterial contamination of water as unsolvable a problem as that of the disposal of nuclear waste?

Congenital Deformities

Let us again start here with the official position

> *"On an average ten percent of all new born children will have some defects or the other. They include cleft palate and additional fingers. The birth defects can be seen in any village."*
>
> *Dr K* S Parthasarathy Secfetory
> Atomic Energy Regulatory Board
> *Times of India* 13 9 1993

What constitutes a birth 'defect? When Dr Parthasarathy talks of birth defects he might be including very minor conditions like skin tags, birth marks, etc. These minor conditions have not been included in our survey. The number of deformities detected would also depend on the skill and the instruments used for detection. Thus, X-rays and sonography techniques would detect some occult internal organ deformities that may not be apparent to the naked eye. It should be noted that the ten percent figure quoted by Dr Parthasarathy is much too high . and not supported by any study of congenital deformities done in India.

Unfortunately, there is a dearth of studies on the prevalence of congenital malformations in rural populations in India. Available data (see for instance references given in Dr I C Verma's authoritative book "Genetic Disorders in India"), are mainly concerned with incidence in hospital births in urban settings in which all births are examined by doctors and which also include autopsies of stillbirths and dead children in some cases. In a prevalence study like ours, the detection of congenital malformations is likely to be much less, since the chances of survival of individuals with life-threatening malformations are **slim and hence they would not be observed. It is known that 70% of deaths due to congenital malformations occur during the first year of birth. Also hidden internal organ malformations are likely to be missed in our procedure.**

The only large prevalence study of the general population in India was carried out by the Anthropological Survey of India. This survey was conducted in 96 locations spread over 14 states and covered 47,974 individuals. The frequency of major and minor defects was 9.8 per 1,000 though considerable regional variation was observed. Unfortunately, despite all our efforts, we have not been able to receive a copy of this study and have had to rely on the references to it in Dr I.C. Verma's book. Although we are not able to make detailed comparisons regarding prevalence of deformities in different age groups, the percentage of deformities that we find in the distant villages is well within the range of this study, while those in the proximate villages are significantly higher This study also found that in the general population there was a marked preponderance of musculoskeletal deformities, which we too observed.

> ***Last year my baby died. He was one year old. He had a big swelling between his buttocks. He was born like that. He never learnt to sit. We took him to many doctors in different places. A lot of money was spent but to no avail. He died.***
>
> **Sojano**
> **locolResdent**

Hospital studies from various regions report a very wide variation (ranging from 37.9 per 1000 to 2.5 per 1000) in the incidence at birth of deformities. The last two year's births in our study show that the deformities at birth in the distant villages (15.2 per 1000) fall well within the above range, whereas those in the proximate villages (77.5 per 1000) are much higher. Deformity studies in the state of Rajasthan (which also include stillbirths) have reported an incidence ranging from 17.3 to 21.3 per 1000. They have reported a high incidence of neural tube defects which were responsible for considerable stillbirths and neonatal deaths. It seems likely from the description given by mothers and midwives that a good number of deformities seen in stillbirths and in babies who died soon after birth in the proximate villages could have been due to neural tube defects.

Reports from the Pickering nuclear power station in Canada (see *Anumukti* Vol.5 No.2), indicate significant increases in the incidence of various birth defects. As can be seen from Table 1 routine emissions from RAPS are on a larger scale than those from Pickering. The recorded occupational dose to workers is also much higher at RAPS. A point which needs to be considered in this connection, concerns the dietary and hygienic habits of the local population as compared to that in Canada. If there is radioactive contamination of the land and water sources due to routine emissions, the effects are likely to get accentuated in Indian conditions where people eat far more locally grown food than their counterparts in Canada. Similarly, our habits of defecating in the fields are likely to help in the recirculation of radioactive contaminants.

Early Deaths

Scientists at the University of Bremen in Germany noticed in 1986 that one-day mortality in newborn babies, during the months following the Chernobyl registered a sudden rise in those areas of the country which had been most effected by the radioactive fall-out due to the accident Northern parts of Germany which had remained relatively unaffected by the fall-out, did not register any such rise in deaths amongst one-day olds. Although Chernobyl was a massive disaster and involved the release of millions of Curies of radioactivity, the affected region of Germany is more than two thousand kilometres away, and the radiation dose received by foetuses in the wombs of their mothers there, was not greater than that received regularly by foetuses in villages surrounding RAPS.

The British Medical Journal of 9th February, 1992 (vol.304 pp 343-6) carries a study by Prof. RK.Whyte of McMaster University, Hamilton, Ontario, Canada which, demonstrates a correlation between atmospheric atomic bomb test in the 50s and 60s and rise in infant mortality. The high statistical correlations indicate that there was an excess of 320,000 infant deaths in the period 1950. 1980 in the USA and UK alone. All first day infant deaths, neonatal deaths (within the first 28 days) and still-births were included in this study.

In a memorandum on the implications of the Whyte study, Dr Sternglass says that today, there could be millions of persons aged 10 to 45 years who have been harmed by the atomic bomb tests because some ten times more underweight babies survived who, nonetheless, frequently showed physical and mental problems. Therefore the greatest health and economic damage through fallout would not be increased rates of leukaemia and cancer among children, but instead an increase in premature and under-weight births. This would result in increased infant mortality, impaired pregnancy and immunological deficiencies in children that survive. For every thousand live births the number of underwieght babies is some 100 times greater than that of children dying from cancer and leukaemia.

We can see very clearly prom Table 11 and Table 14 that untoward pregnancy outcome* are significantly higher in the villages near RAPS.

A Note on Untoward Pregnancy Outcomes

Untoward outcomes comprise:

. Complete loss of fertility resulting from the most severe degrees of damage to male or female reproduction.

. A reduction of fertility whether in the male or female partner.

. A conception which is impaired. This impairment can be due to any of the following causes.

- **An inherited genetic defect which may have been passed through the germ-line of either parent, e.g. familial retinoblastoma or cystic fibrosis**
- **Because it may have been exposed to a mutagenic influence prior to conception leading to damage to the fetal genetic material for example, sporadic or non-familial genetic disorders**
- **Because the earliest cell divisions result in an aberrant chromosomal constitution, the origin of which may be traceable to either parent, e.g. Down's syndrome:**
- **Because it has been exposed to teratogenic (tending to produce fetal monstrosity) influences, leading to other than genetic damage, the effect often being modified by other genetic and environmental influences (multifactorial effects). Teratogens act after conception; examples would be the thalidomide drug or maternal exposures to high doses of radiation leading to fetal microcephaly.**

From a Testimony by
Prof. Eva Alberman

> ***Sita had a baby. Couldn't drink milk. Was soft like a quilt. He was deformed. Lived for a short while. Chousar Bai had a son. Soft, very soft. He was born dead. No movement in the abdomen for more than a month. I attended three miscarriages during the past year.***

Kes Bol
Local Midwife

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 6 Number 6 June / July 1993

A Look At The Bright Side of Nuclear Energy

Reading *Anumukti* is generally a depressing experience. It is full of news of nuclear follies and disasters, radiation spills, cancers, deformed children and such. Don't you think you and your readers are entitled to some cheerful news ? I think so. consider the following.

The AEC has stated that India has a target of 5800 MW for nuclear electricity by 2001. Considering that we were being threatened with 20,000 MW of it in the mid 70's, this is indeed good news! The target was reduced to 10,000 MW in the 80's. Further, the bulk of this revised burden is sought to be inflicted on us through the 'advanced' 500 MW reactors Since these advanced reactors have not advanced beyond the drawing board, we can expect a further lowering of target in the coming years. I think chances are bright that we will enter the next century with no more than a dozen reactors working at 30-40% of their capacity.

An atomic power plant working below capacity should also be treated as good news. A 100% power efficient reactor produces more than twice the radioactive pollution and wastes compared to one working at 50%. Radioactive effluent treatment plants designed for a 235 MW reactor will work that much better if the reactor works only at about 150 MW. 1 am not suggesting that radioactive discharges from our nuclear reactor are actually being contained, but these discharges could have been much worse had the reactor operated continuously.

The safest reactor in the world is the one which has not been built. But among the ones actually built, the safest reactor is the orw which is not working. Since our reactors spend more.than half their life in this highly desirable state, the margin of safety, on the lives of people around also increases proportionally. A nuclear power plant in coma may be a financial loss. But it saves human lives, produces less waste to burden the future generations and is easier to decommission too! Frequent tripping off of atomic power plants also sends the right message to the state electricity boards - nuclear power is unreliable. In a globalised, liberal economy, where efficiency and cost effectiveness hold the key to survival, we can surely look forward to the well deserved demise of atomic energy as has happened in UK. All anti-nuclear activists in India should also thank BHEL whose turbines have progreased from breaking their blades, which needed a few months to repair, to going up in flames which can shut down the reactor for more than a year. No matter how righteously the nucleocrats proclaim that the turbine breakdowns have nothing to do with reactor operations, what counts ultimately is the number of units that the power plant as a whole delivers to the grid. BHEL, whose faulty turbines contribute significantly to lowering that count as well as radioactive discharges, is entitled to at least a certificate of merit for "outstanding contribution by a Public Sector Undertaking towards the environment".

Did you know that a nuclear reactor can be imported by practically anybody in India? Time was when the babus in different arms of the government decided what was to be imported and what was not. These worthies used to dictate exactly how much groveling you had to do before they favoured you with an import license. Not any more. Thing's have changed under Manmohanomics. There is only a short "Negative list". Anything not explicitly banned under this list can be freely imported. And a study of the list reveals the surprising fact that only radioactive materials are excluded. If you have the fuel and the funds, you can import any reactor of any design, including graphite moderated ones from Chernobyl.

There is a catch, though. Under section 84.01, Sub headings 8401.10 to 8401.40 of the Indian customs Tariff as amended by Union Budget of 1993-94, nuclear reactors and parts there of as well as fuel elements (cartridges), non irradiated of course, attract the highest duty slab of 80%. An year ago, the duty levied on these same items was only 60%. In other words, a nuclear reactor imported in 1993-94 would be 20% costlier than in 1992-93. One suspects some sort of connection between this and the not-yet- totally-dead issue of Russian reactors at Kudamkoolam. Perhaps a wiser reader may throw more light on this.

Plenty of light also needs to be thrown on the solar village planned by the Dept. of Non Conventional Energy Sources. (I have always wondered why something as natural as sunshine or wind should be dubbed as 'non-conventional' and a convoluted technology like N-power be accepted as 'conventional*. There certainly is a need to change our conventions.) The village of Kalyanpur in U.P has gone fully solar and is to be inaugurated by no less a dignitary than the PM, in April. True, the funds allotted for such endeavors are meager and their main role is perceived as substitutes for the petroleum products, but **these are** the first, faltering steps in the right direction. Let us hope that our non-conventional energy projects get managed much better than the conventional energy projects get managed much better than the conventional ones.

Last but not the least, the disinformation campaign launched by our beloved editor of Anumukti is having the desired effect. We **all** know he is bluffing when he threatens to double the subscription rate overnight. Even nuclear costs do not rise that rapidly. Still, I am not taking chances. Dear Editor, your cheque for Re 260/- for a lifetime subscription is enclosed.

Sonjoy Havonur

Unlike nucleocrats, I don't bluff when it comes to money. See the subscription rates on the last page.
— Editor

From the Editor's Desk

Are Courts the Answer?

After hearing all the arguments in the petition praying for the reconsideration of the decision of the Government of India for locating the atomic power plant in the midst of a tropical rain forest at Kaiga in Karnataka, the Supreme Court on 7th May, 1993 passed the following order:

'The Centred Government will consider the report of December, 1990 submitted by NEERI (National Environmental Engineering Research Institute) and also the written submissions that may be forwarded by the petitioners to the Secretary, Department of Atomic Energy of the Government within four weeks of today, and will take its final decision in the matter of establishing the atomic power plant in consultation with the concerned departments including the Department of Environment. If the Government so desires, they may also hear the petitioners in person. However, it is made clear that it is not obligatory on the Goveminent to hear them.

Does this order represent a victory or a defeat for the antinuclear movement? Friends in Karnataka were jubilant and said that Sharavati Tail Race hydroelectric project had been shelved after a very similar order of Karnataka High Court. But nucleocrats have been equally happy claiming that the order dismisses objections to Kaiga. Have things come to such a sorry pass that we have to go through this involved, time and money guzzling procedure just to be able to present our grievances to nucleocrats, who may if they so desire give us a hearing"? Is the legal process worth the hassles?

I believe that it is only a strong people's movement which will make the operators who run the system listen and eventually adopt a policy of sanity which would respect people's rights and the environment. Deliverance will not be handed down on a platter by anyone be they learned judges and powerful politicians in New Delhi or enlightened bureaucrats in the World Bank.. First of all, these worthies need to be educated themselves. Only a people's movement can accomplish this stupendous task. Let us not waste any more effort in frivolous pursuit.

Implications of the Near Miss at Narora

How long can operator skill and heroism overcome absence of safety culture?

Indian drivers are usually quite skillful. They have to be. The condition of our roads, the diversity of our traffic and the near total absence of traffic rules makes skill a necessary condition for survival. Yet, India has one of the highest casualty rates for road accidents in the world. If one considers the fact that traffic in India is much slower than in other parts of the world, then this anomaly becomes all the more apparent. Skill alone cannot overcome the inexorable laws of probability. It cannot be a substitute for a safety culture.

The near catastrophe at Narora on March 31, 1993 brings this lesson once again to the fore. Deplorably, the lesson is unlikely to be learnt. The handling of the 'incident[9] by the nuclear establishment is in striking contrast to its handling by the junior operating staff at the plant. The plant staff showed both a heroic calmness under stress and quick witted innovative thinking. This ingenuity and dedication to duty needs to be recognized and rewarded. In contrast, the top rung of nuclear establishment plumbed new depths of negligence, dissimulation ami self-congratulation.

The Facts

Even after four months, facts regarding what actually occurred are still unclear. The expert committees appointed to look into the causes have submitted their reports but even they have failed to reach a consensus regarding the cause of the fire. Let us recount the facts which are not in dispute.

- **The fire started in the graveyard shift at 3.31 AM.**
- There was a loud explosion which was heard by many people.
- At the time, the reactor was operating at 190 MW.
- The fire originated in the turbine room which is some distance away from the reactor building.
- It continued for close to two hours, whereas smoldering of cables continued till 8.30 AM.
- The fire caused extensive damage to the generator and power supply cables.
- The reactor was tripped manually by the station staff on duty when they noticed that the turbo-generator had automatically tripped after the fire.
- The fire tenders in the turbine hall proved inadequate to control the fire since the flames reportedly spread to the lubricant and sealant oil drums kept in the hall, and the entire structure housing the turbine was damaged.
- Fire extinguishing efforts were hampered by the large amount of smoke emanating from burning wires and parts of the generator.
- Smoke detectors did not work.
- During most of this time the control room of the reactor unit was filled with smoke. The emergency control room—-a special safety feature at NAPS—was rendered useless in the absence of emergency power supply. Narora Unit Two had been shut down for several months, after a generator identical to that in Unit-1 was reportedly damaged on account of overheating.
- The most serious aspect of the fire was that there was complete loss of station power for a period of 17 hours.
- None of the three emergency diesel generators was able to work, since the cables connecting them also burned down.

Defense in Depth

Since the consequences of a nuclear accident are so horrendous, nuclear reactors are equipped with redundant and independent safety systems. The idea being that even if some safety systems malfunction in an emergency, there would be others to do the job and ensure safety.

Of primary importance is the safe shutting down of the reactor. In Narora, there are two fast acting shut-down system*. The primary shut-down system consists of 14 control rods made of cadmium. These cadmium rods drop into the reactor core under gravity whenever a trip signal is received. They halt the fission reaction in less than two seconds. Besides the primary shut-down system, there is a secondary shut-down system as well. In Narora, this consists of filling up 12 vertical cores in the reactor core with lithium pentaborate solution. Boron has an extremely high neutron absorption cross section. Thus any neutron which comes in contact with a boron atom gets absorbed and thus unavailable to continue the fission reaction. According to newspaper reports, both the fast acting shut down systems are further backed by the automatic injection of controlled quantities of a boron solution into the reactor's moderator system. Even if there is complete electricity blackout in the station (as did happen at Narora) and the secondary shut down system cannot work, this arrangement ensures the addition of boron to the moderator under gravity.

The operating staff on duty noticed the smoke coming out of the turbine room and realized from the control panel that the fire had tripped the generator. The primary shut-down system was immediately initiated and it did work. Based on the reports it is apparent that the automatic injection of boron into the moderator system under gravity also worked. In any case the fission reaction was successfully halted. A question that comes to mind is that why was it necessary in this case for the operators to initiate the shut- down system? Shouldn't it have taken place automatically? Perhaps, some technically qualified readers can throw light on this point.

In a nuclear reactor halting the fission reaction is just the first step. The fission of uranium produces a large variety of radionuclides which continue to 'decay[1] and give off additional amounts of energy. This decay heat is a substantial amount—nearly seven percent of the reactor's heat at full power—which needs to be removed to maintain the integrity of the reactor. Thus, even after the reactor is safely shut down it needs to be continuously cooled.

Senior nucleocrats have waxed eloquent on the Indian designed 'passive' cooling system which performed this cooling. Number of newspapers had headlines reading "Passive Cooling System Saved Narora Reactor." RRamachandran, the science editor *of Economic Times*, has written an article entitled 'Thermosiphoning: Pascal alone did it *(Economic Times* 10.4.1993) which describes rather well the way this cooling was accomplished in the absence of electric power to drive the primary heat transport pumps. The following four paragraphs are a quote from this article:

What if Shutdown Systems Fail? Catastrophe!

CANDU reactors like the ones at Narora (U.P.), Kakrapar (Gujarat), Kalpakkam (Tamilnadu) and Rawatbhata (Rajasthan) share an unhappy feature of Chernobyl (RBMK) type of reactors. The technical term for this feature is "positive void coefficient of reactivity". The nuclear fission reaction tends to increase rather than decrease as the temperature of the reactor core increases and more heavy water coolant gets boiled off. This leads to an uncontrolled runaway increase in the reactor's power level as happened at Chernobyl. Safety studies conducted on the CANDU type reactors show that a failure to shut down the reactor when required, would result in a complete failure of other safety systems and a reactor 'disassembly'. Nuclear engineers consider this simultaneous failure of the three separate shutdown systems as an 'incredible' event against which no defense can work.

"Indeed, the incident has helped validate a passive cooling system built into Indian Pressurised Heavy Water Reactor (PHWR) design for safe shutdown of the reactor. The system is based of what is called thermosiphoning which enables circulation of the coolant in the core of the reactor when power supply to the reactor gets disrupted, like in the present incident, and power for forced circulation of water with the aid of pumps and the like then becomes unavailable.

"Under usual reactor shutdown conditions, forced circulation of primary coolant, by keeping the primary pumps running, ensures this. Even if the primary pumps fail, there is an auxiliary diesel generator available which can be pressed into service. But in situations of complete station blackout like last week (when even the cables leading to the diesel generator line got burnt), though the reactor shuts down, the heat generated by decaying fission products needs to be removed quickly.

"Initially, soon after the reactor trips and power supply to the pumps fails, the coolant circulation is provided by the flywheels mounted on the pumps whose coasting down achieves the necessary initial circulating flow. Subsequently thermosiphoning principle takes over and maintains a natural circulation of the primary coolant. This thermosiphon flow should be adequate to transfer the decay heat to secondary coolant in the steam generators (SGs). Thermosiphon flow is an important design feature and enhances the safety of the reactor under off-normal conditions.

In fact, only in December 1992, an off normal situation was simulated in the NAPS-1 core and adequacy of thermosiphon cooling studied. Though such studies are routinely carried out in reactors abroad, this was the first such test in an Indian PWR. The tests had found that the cooling due to thermosiphoning was as predicted According to the scientists of Bhabha Atomic Research Centre (BARC), who con-

ducted the simulation studies, the real-life situation of a power failure proved that this auto-cooling was adequate,"

What Mr Ramachandran has forgotten and what high ranking nucleocrats have conveniently left unsaid, is the fact that primary heat transport system cannot go on cooling if it in turn is not cooled. There is only a limited amount of heavy water in the system and after removing the heat from the reactor core, this heavy water gets hot. During normal operation, the hot heavy water under pressure is cooled through a heat exchanger where it heats ordinary (light) water in a secondary (steam generator) circuit. This secondary system water becomes steam and is used to run the turbines to produce electricity. However, due to total station blackout, the secondary system's pumps also could not work. It was here that the station's operators showed ingenuity and courage. Their heroic role is mentioned in a report in *The Hindu* on April 4 and is also recounted in Ms. Rupa Chinai's article "Narora: When Emergency systems' fail in *Sunday Observer* of April 18, 1993. The following is an extract from her account:

"While the Primary Heat Transport (PHT) System remained intact with heavy water supply; the loss of power prevented circulation of light water from the boilers, which served to cool the PHT system and transport heat from futl to the boilers. Thus, the removal of reactor core heat was retarded

"In the few minutes before toted power was lost, the operators managed to open the 'Safety Blow Off Valves' to start the cooling process in the reactor, enabling steam to be released.

"But they still had to feed the boilers, which began to run out of light water. This was manually accomplished with the use of fire fighting pumps funning on their dedicated diesel generator, transporting water to the boilers after the valve in the outer containment of the reactor was opened. This was possible because of the hemic efforts of individual reactor operators, who risked exposure to heat and possible radiation, when they reportedly entered the outer containment shell of the reactor to manually open a valve, thereby ensuring water flow to the reactor boilers which in turn controlled temperatun of the reactor core. By this they averted severe damage to the reactor core."

Despite the much trumpeted claims of nucleocrats, it was not only the •passive' cooling system "designed by Indian scientists" which prevented core damage. It was the brilliant thinking which utilised the diesel generator of the fire-engine to provide 'active' cooling, and the fact that unlike nuclear "defense in depth" safety systems, fire engine diesel generators do work, which prevented a debacle.

> *The operators deserve the nation 's gratitude for saving it from a disaster in one of the most fertile and thickly populated regions of the country. But what about the senior nucleocrats and ignorant politicians who have put Ganga Mai under this everlasting threat?*

A word needs to be said regarding this "designed by Indian scientists" nonsense. I would be the first to cheer any genuine expression of In* dian creativity, but frankly, I find this attempt to pat one's own back on totally undeserved grounds, disgusting. The "passive[9] cooling occurs due to the way the primary heat transport system has been designed and the design in Narora is no different in its general layout from that of other CANDU tractors operating elsewhere in the world. Thus, if credit has to be given for this passive system, it should be given to the original Canadian designers of the CANDU type of reactors.

The Cause of the Fire

All accounts agree that the initial cause of the fire might have been a spark caused by a fault in the electrical system, somewhere in the cable tray underneath the turbo-generator. However, there are wide variations in versions presented by various high-ranking nucleocrats in different newspapers. The version presented by M. Satish and R. Ramachandran in *Economic Tunes* of G.4.1)3 where they quote Dr. Chidambaram, the Chairman of the Department of Atomic Energy is as follows:

"The smoke sensors in the power control room did not detect the fire in the generator area immediately, Dr. Chidambaram said, probably because the smoke itself did not build up for some time. It was also around this time that many persons reported hearing a loud blast, akin to an explosion.

"The "explosion" seems to have occurred during the long coasting down period of the shaft from its high rotor speed of 3000 rpm, the AEC chairman disclosed

"According to investigators, the reason for the explosion could be something like this: as the shaft began to reduce speed, some of the burning cables nearby may have got entangled in it, applying severe instantaneous torque in the reverse direction. The "explosion" could thus turn out to be the massive sound created as a result of a damage or breakage of the coupling shaft. What adds credence to theory is that most non-inflammable parts of both the stator and the rotor of

the generator are said to be intact, and can be salvaged."

In the same article, they expressly add,

"Most fires in hydrogen-cooled generators in the past have been caused by leaking hydrogen.. Whereas in the case of NAPS, no untoward pressure drop in the hydrogen circulation was noticed."'

The Director of Engineering at NAPS, Mr G. Ghosh, also ruled out hydrogen being the cause of the fire saying, *"the area was so wide and open that for a hydrogen explosion to take place, there would have to be a very large leak of hydrogen and this was not possible because the level of hydrogen was monitored continuously."*

As opposed to this we have the previously referred April 4th report in *The Hindu* and Ms Rupa Chinai's article in the Sunday Observer where there is a totally contradictory version of events. To quote:

'Technical inquiries by experts have so far reportedly assessed the fire to be the result of a fault in the electrical system, and leakage of hydrogen gas within the generator. The consumption of hydrogen gas required by the generator, had shown an increase over one week, pointing to an internal leakage of the gas.

'This, however, did not give rise to a general alert from those manning the control room. Reportedly, no effort was made towards remedial measures. It is thought that hydrogen, which is used as a coolant, could have triggered the fire, which erupted from either the cables or oil."

The Official Version

The official press release put out by the Atomic Energy Regulatory Board on July 8th, that is well after the inquiry committee submitted its report, is silent regarding previous leakages of hydrogen.

"Failure of two turbine blades resuited in a severe imbalance of the large rotating mass, causing extensive damage to the bearing of the machine as well as to the various accessories and components of the turbine and the generator. In the process, the leak-tightness of the generator hydrogen seals was lost, leading to a hydrogen leakage and a fin."

Nucleonics Week, the nuclear industry journal published from U.S.A. knew the contents of the committee's report far in advance of any Indian newsmedia. In its issue of 17th June, 1993, it states:

The inquiry committee set up to investigate the 31 March fire at NAPS is split on the cause of the accident, and the DAE may be presented with two reports. One section of the committee says that the fire was caused by the shearing of two turbine blades Which in turn was caused by fatigue inflicted on them by frequent grid disturbances. (Voltage control on the Indian grid is often erratic, with brown-outs and black-outs not uncommon.) The other section of the committee has traced the cause to a duct at the generator busbar coming loose. This means, in effect that the generator maintenance was at fault and not the turbines.

Public Safety Issues

Madhusudan Srinivas in his article The Narora Fire and the Communication Gap" in *Frontline* brings out the public safety aspects of the fire.

"Though emergency drills have regularly been rehearsed since 1989 (one had been scheduled for 11 cum. on April 1), when the real alarm went off at 3.35 a.m., the immediate reaction was panic. For some two hours, there was no official communication—either from the plant authorities or the district administration—to the inhabitants around NAPS. Between the relent-

Not A Day Too Soon

The Atomic Energy Regulatory Board's directive to the Nuclear Power Corporation to sequentially shut down all CANDU type reactors for a thorough inspection of the turbines, generators and associated components is not an instance of a 'smart' regulatory body on the job but rather a case of "too little, too late". Consider

Madras Atomic Power Station Unit-1 (July 23,1983)
Site emergency declared due to fire in the boiler room.

Rajasthan Atomic Power Station Unit-2 (July 25.1985)
Unit operating at 190 MW. "Catastrophic" fire in the boiler room

Kakrapar Atomic Power Station Unit-1 (September 15,1991)
Fire in the boiler room during testing before reactor opening causes extensive damage, delays opening by nearly one year.

Yet a fire in the same spot at Narora when the reactor was operating at 190 MW! isn't it time AERB realised that BHEL generators are unsafe while operating nearfull power ?

less wail of the alarm and the darkness around the plant (which is normally brightly lit) the villagers were left to draw their own conclusions. By the time the authorities sent out the information that the fire had been brought under control and that there was no radiation leak, large numbers of people had packed their bags and a few had actually fled."

According to a report in *Safe Energy and Environment,* NAPS authorities had asked the District Magistrate to keep 2,000 buses in readiness for evacuating the people if necessary, but the Magistrate had expressed his inability to do so at such short notice. This news, if true, is an eloquent comment on the state of emergency preparedness near nuclear facilities. Do the authorities think that emergencies will come with adequate prior notice? Probably civil authorities are competent to arrange buses only for political tamashas where they have enough advance warning.

Incompetence at the Top

> *"The chairman told newspersons on Monday that the fire was 'unusual' because of its magnitude and location, which was below the turbogenerator—"a very unlikely spot."*
>
> 'New panel fo probe Naroca mishap"
> Observe Economic Bureau
> Observer of Business & Politics 6.4 \ 993

> *"July 23, 1983:*
> *Stand by emergency was declared to fight the fire in unit-1 (MAPS) boiler room and below the TG"*
>
> •Review of Rodtatton Emergency OrWs and Actual Emergencies Declared at Madras Atorrtc Power Station'
> S. Paramesvaran, R. S: Vocodhan. T. S. V Ramanan
> Thrid National Sympotfum on Operating Experiences of Nuclear Reactors & Power Plants

How many fires need to start under the turbogenerator, before Dr Chidambaram considers that as a likely spot and takes appropriate precautions?

> *"Wepropose to make improvements in electrical cables like fitting survived cables and fire barriers."*
>
> Chairman of the Nucleou Power
> Corporation, Mr S K Chotterfee,

What was Mr Chatterjee doing after the RAPS fire of July 25, 1985? Should these Improve* ments not have been made at least then as one of the lessons learnt (see following article).

Lessons that the Public Needs to Learn

Fires in nuclear power plants are nothing new. Fire at the Brown's Ferry nuclear power plant in the U.S. as early as 1975, had demonstrated common mode failures. (Failures of multiple standby safety systems as happened at Narora). It had highlighted the need to isolate cables controlling independent safety systems. Although the Brown's Ferry fire took place before any substantive construction had even begun at Narora, this elementary precaution seems to have escaped the designers.

Even within India, the Narora fire is not the first instance of a major fire in a nuclear power station (see following article). But the nucleocrats have been behaving as if it is.

The main lesson the public needs to learn from the near miss at Narora is that nucleocrats and politicians will never learn and public safety can only be ensured when the public itself forces a closure of these deadly, demented machines.

There is another small lesson which too can be of immense benefit to the public. Like the dog in Sherlock Holmes' story, the smoke detectors in nuclear plants never seem to bark. The Nuclear Power Corporation would do a lot of good if they would only publicise the type and make of their smoke detectors so that the public would know which detectors to avoid. In all probability, these smoke detectors are the ionising type which *use* radioactivity of Americium-241. Nuclear authorities should immediately themselves switch over to nonradioactive smoke detectors which use photoelectric cells and advise the Atomic Energy Regulatory Board to ban ionising smoke detectors which don't work and are a serious source of radioactive pollution.

Surendra Gadekar

The main lesson the public needs to learn from the near miss at Narora is that nucleocrats and politicians will never learn and public safety can only be ensured when the public itself forces a closure of these deadly, demented machines.

A Wasted Warning

Lessons Not Learnt from a Fire in RAPS in 1985

The Narora fire of March 31, 1993, despite newspaper claims of nucleocrats to the contrary, is not the first time an operating nuclear power plant in India has come close to the brink. Rajasthan Atomic Power Station (RAPS) for instance, suffered a serious fire in 1985 within the reactor building itself The official account of this fire has been published four years after the event in an obscure Bhabha Atomic Research Centre publication and makes chilling reading, Although written in a nuclear engineer's jargon, we reproduce it in full and provide a glossary which we hope would be sufficient to decode the officialese.

Handling Experience of Reactor Controls During Large Cable Fire Incident

R. Venkata Raman

Third National *Symposium on* ***Operating*** *Experience* ***of Nuclear Reactors & Power Plants***

March 15-17,***1989***

25th of July 1985 was a critical day in the operation of Rajasthan Atomic Power Station (RAPS) Unit-2. On this day, when the unit was operating at 190 MWe a catastrophic fire ignited in boiler room. The resulting inferno disabled many vital instruments and indications, jeopardising reactor safety.

In spite of the non-availability of important indications and display of many false system status indications, the station operating staff managed to bring the reactor to a safe shutdown condition, thus averting a potentially dangerous situation.

Brief Chronological Description of the Incident

10.12 Heat Transport Pump No.2 tripped.

10.13 Reactor tripped on high differential temperature followed by turbine trip.

10.18 Reactor was reset and fast start initiated.

10.22 Heat Transport Pump No.9 stopped for 3-3 pump mode operation, but the pump tripped immediately. All the heat transport pumps had tripped due to ground fault and instantaneous overcurrent as observed from their respective breakers subsequently.

10.26 Suspecting major problem, station startup was abandoned, reactor was scrammed and crash cooldown was initiated.

During the above period, the following safety systems got actuated:

1. Emergency Injection Operation indication appeared.
2. Dousing system Red Lamps for valves closed position disappeared, indicating possible unlocking of the valves, preparatory to operation.
3. Reactor Building got Box-up.
4. A number of critical 48 Volt supply fuses blew making connected loads non-operational.

Also the following critical systems became unavailable:

1. . . Heat Transport System Pressure Control on wide range.
2. Floor beetles in boiler room got actuated spuriously, wrongly indicating large water leak in boiler room.
3. Valving in of shutdown cooling system became inoperative due to spurious initiation of Emergency Injection.
4. The fire and smoke detection system alarmed only at 10.35 hours (23 minutes after the incident), delaying **protective measures till then.**

There were six indications that ruled cut the possibility of a large leak either from the Heat Transport System, Secondary System or the Process Water System.

1. **Heat Transport System Storage Tank level was steady.**
2. **Boiler pressure and feed water pressure were steady.**
3. **Boiler levels were steady.**
4. **Low pressure and high pressure process water system pressures were steady.**
5. **Area Radiation Monitors registered normal values at this time.**
6. **Boiler room pressure was normal**

Actions Taken

Acting on the above basis, the following actions were taken by control room personnel, despite the above handicaps:

1. **Spurious actuation of the Emergency Injection system and possible actuation of the dousing system were blocked.**
2. **As heat transport pressure recorder was reading off-scale, controller malfunction was suspected and**

A Glossary of Technical Terms

3-3 Pump Mode Operation

The steam generator is operated with an equal number (three) on both sides to maintain balance of pressure in the reactor.

Ground Fault

Pumps are operated by motors connected to the electrical power supply. If a point on the winding becomes connected to the ground on account of damage to insulation, a large current (an overcurrent) may flow. This is sensed by the protection equipment which opens the circuit breaker thus disconnecting the motor from the power supply.

Dousing

This is an emergency water spraying system to reduce the steam pressure inside the containment building in the event of a steam leakage and pressure build up to prevent the possibility of a steam explosion.

Box-Up

The reactor building gets isolated from the outside by closure of dampers in the ventilator to prevent escape of any radiation which may have built up.

Emergency Injection

The Emergency Core Cooling System (ECCS) will iryect cooling water into the Primary Heat Transport System (PHTS) when the primary cooling fails by leakage through a pipe.

48 V Supply

A number of critical reactor con= trol, measurement and breaker operations use the 48 Volt direct current power supply (battery).

Heat Transport System Pressure Control on wide range

The enormous heat produced in the reactor needs to be expeditiously removed at all times. This is done by circulating heavy water at high pressure. High pressure is needed to prevent boiling. Heavy water at atmospheric pressure would boil off. But this enormous pressure has to be adjusted within specified limits. The range of pressure is regulated within H wide and a narrow range by separate mechanisms.

High Differential Temperature Trip

The temperature difference between the inlet and outlet arms of the primary heat transport system has to remain within a specified range. If this temperature difference becomes larger than required due to the tripping of one of the pumps, this would upset the balance between the hot and the cold legs of the system and initiate a turbine trip.

Valvlng In

To open the valves (in this case the valves of the shutdown cooling system).

Shutdown Coding System

Two Shutdown Cooling Systems connect to the reactor inlet and outlet headers, essentially in parallel with the primary pumps and steam generators. As the reactor cools down, these systems, each with a pump and heat exchanger gradually take over decay cooling. Initially pumping force through the heat exchangers is provided by the primary pumps, but, as the coolant temperature decreases, shutdown cooling pumps assume this function and the primary pumps and steam generators are isolated.

Note: The thermosiphoning effect leading to passive cooling mentioned in the article "Near Miss at Narora" in this issue also performs the same function

Jumpering

In this case the Emergency Inejection Control System was bypassed by putting a short circuiting wire between the input and output points and the control supply was directly connected to the system which controlled the valves of the shutdown cooling system.

Incipient Degradation

In a cable joint, duo to the esrtosive effect of moisture or due to other causes, the joint slowly becomes open in small areas finally leading to a heavy arc of a huge current.

pressurising pumps were put off.
3. Shutdown cooling system was valved in by jumpering the emergency injection logic and the system maintained solid by starting the auxiliary pressurising pump (Fueling machine supply pump) and maintaining the system pressure

by the indication provided on the shutdown cooling loop.

Meanwhile all entries to the boiler room were thwarted by the presence of thick black smoke and soot. Boiler room ventilation was shutdown to prevent possible spread of fire.

Reactor building dampers were opened to purge out the building atmosphere and also depreasurising damper was opened. At 1900 hours ventilation duct manhole cover was opened and boiler room smoke was fully purged out. At 2100 hours first proper entry into boiler room could e made and by this time fire was completely extinguished

Control Room Staff Handling of the Incident

Que to the huge fire in the boiler room, many control cables were damaged, thus making vital indications, systems and controllers unavailable. Also many safety systems got spuriously actuated and false indications/informations were flashed into the control room annunciation system.

To sift out the false indications, discard the false information and come to the right conclusion became a difficult task.

But, the availability of some vital indications despite the fire, good system knowledge and experience among the control room staff resulted in good operator response leading to the safe shutdown of the station. The availability of expert knowledge and other forms of help from the general shift, Technical Unit staff, Fuel Handling System staff and the maintenance staff present at the time of the incident was a big help.

Also the maintenance of a calm environment without panic in the control room led to the fast and correct actions being taken to mitigate the consequences of the fire.

Cause of Fire and Rehabilitation

The incipient degradation of the integrity of the 3.3 kV cable joint of heat transport pump No.2 resulted in a heavy drawal of arc which in turn ignited the fire and this spread to surrounding power and control cables, thus causing the accident. The oil deposition on the power cables in boiler room could have aggravated the situation.

All 3.3 kV and 415 V power cables totaling 250 in number damaged by the fire, were replaced and nearly 70 joints made using the Raychem technique. All control cables were terminated in 9 newly installed junction boxes. Rerouting of power and control cables were also done. This was a massive job involving site and outside agencies.

Modifications

1. Smoke detectors were installed in discharge ducts of boiler room cooling fans, to trip the fans in case of fire.
2. Spraying of fire retardant paint was done on cables in boiler room.
3. Fire barriers were constructed.
4. Tray covers were provided on top of control cable trays.
5. 3.3 kV cable joint temperature monitoring was made available.
6. Regular cleaning of cables to remove oil deposition was initiated.

Lessons Learnt

1. Fire re tardant cables to be used in future.
2. Cable joints to be avoided.
3. Installations of automat* ie fire extinguishing systems to be provided.
4. Adequate separation between power and control cables to be provided for.
5. Provision for closed circuit television surveillance of potential fire hazard areas.

Concluding Remarks

The fire incident handled was without precedent. Calm and judicious observation by experienced control room staff led to correct and rapid actions being taken to reduce the consequences of the accident and a safe station shutdown.

On the basis of this incident, *appropriate design modification are to be carried out in operating and future reactors,* **not to mention the extreme importance of the availability of trained adequate and experienced manpower for safe handling of such accidents.**

Evidently, the "lessons learnt" in 1985 at RAPS remained confined to published reports and did not result in any modifications to layout design and operating procedures at Narora. Even essential fire fighting equipment was absent. Will Narora lessons help in avoiding a future catastrophe? With the nucleocratic mindset being so impervious to self-examination, the prognosis is not good.

OOPS! We Goofed

Self Serving Antics of the International Atomic Energy **Agency**

In 1986, just after the nuclear disaster at Chernobyl, nuclear industry worldwide was in doldrums. If an accident of this magnitude could happen in Russia, it could happen anywhere. Despite all attempts at playing down the scale of the accident at Chernobyl, the industry and IAEA knew very well that the public would not tolerate an industry with a potential for causing such cxitastrophes. It was imperative to find an excuse-an extenuating circumstance demonstrating that what happened at Chernobyl was an aberration, a state of affcurs so abnormal and unrelated to nuclear operations, that it could not in any likelihood be repeated anywhere else ever again. The Soviet nuclear establishment was understandably eager to find scapegoats amongst the operating staff and shift the blame away from itself

The interest of both these powerful lobbies were thus coincidental and hence at the Vienna Conference on Nuclear Safety in August of 1986, there was a great deal of mutual bonhomie. The Western nucleoctxits went gaga over "Soviet openness", while the Soviets were full of talk of "International cooperation and solidarity" in the nuclear field. Soon afterwards International Atomic Energy Agency sent a team of 14 'experts' from 14 nations—International Nuclear Safety Advisory Group (INSAG) to study the accident in detail. INSAG presented a report (INSAG-1) which came to a number of conclusions—atnong them$_f$ that tlie accident represented "almost a worst case in terms of the risks of nuclear energy/' It went on: "As discussed in detail atnongst the experts, the accident was caused by a remarkable range of human errors and violations of operating rules in combination with specific reactor features which compounded and amplified the effects of the errors 'and led to the reactivity excursions."

One would expect that since these were ' Inter nationally Renowned Experts' giving their considered opinion after many months of deliberations and after any number of computer simulations and other such high-tech wizardry. their opinion would be of lasting value to future generations. Specially since their 'expert opinion' was instrumented in sending some operators to jail for a period of five years on charges of gtx>ss and criminal negligence. The public prosecutor cited the INSAG-1 report as proof that international experts agreed with Soviet authorities that the RBMK design was not to blame.

As the following piece so charmingly puts it, much has changed in the last seven years both politically and technically. Western nuclear industiy has survived the Chernobyl blotv, but is today desperately looking for orders for new construction of power plants and its eyes are set firmly towards tlie erstwhile Eastern Block. Its interest no longer coincides with that of the nuclear establishment in the old Soviet Union. Thus, we now have a revision of INSAG-I by another group of 'experts' of the International Atomic Energy Agency which finds the conclusions arrived after so much deliberations by INSAG-l to be erroneous and in need of 'updating'. One wonders if this is the final version of what actually transpired at Cliernobyl or whether another change in the political and economic climate would produce another updated INSAG report.

INSAG Revises Chernobyl Report

It is, it seems, in the nature of human beings to seek scapegoats. In the aftermath of a major catastrophe there is an instinctive search for an individual or individuals, to blame. In the case of Chernobyl, it was the operators. In their report—INSAG-1—tasued in September 1986, and baaed largely on Soviet evidence, the International Atomic Energy Agency's International Nuclear Safety Advisory Group (INSAG) ascribed much of the blame for the Chernobyl accident to those in control of the plant at the time.

Much has happened, politically and technically, since then. Most analyses now associate the severity of the accident with defects in the design of the control and safety rods, in conjunction with certain characteristics of the physics design which permitted the inadvertent setting up of large positive void coefficients. It has also become apparent that these deficiencies were known about in the Soviet Union before the accident, but had not been corrected.

In its recently released second report on Chernobyl, (INSAG-7 The Chernobyl Accident: Updating of INSAG-1, IAEA, Safety Series 75 1992) the Group revises INSAG-l and places a greater emphasis on design issues.

*

Beyond Vienna

The account given by the Soviets to the 1986 Vienna Conference stated that the accident arose through a low probability coincidence of a number of violations of rules and procedures by the operation staff and by those responsible for authorizing the test.

The analytical work which followed in late 1986 had the benefit of Soviet data on the control rod configuration, the power level and the spatial distribution of power just before the accident, as well as information on the thermal-hydraulic conditions that prevailed.

Some analysts found that it was difficult to match in their models the time history of the power excursion as it had been published by the Soviet scientists at the Vienna meeting. A search therefore began for an additional mechanism that might have come into play.

The existence of the positive scram effect was first acknowledged by Soviet experts at the Conference on Nuclear Power Performance and Safety in Vienna in 198T. However, the 1991 report on Chernobyl by a Commission of the USSR State Committee for the Supervision of Safety in Industry and Nuclear Power (SCSSINP) states that this phenomena had been known of at the time of the accident and that it had first been identified at the Ignalina RBMK (Chernobyl-type) nuclear power station in the Lithuanian Republic in 1983. But no correction was made following this discovery at Ignalina, no compensatory measures were taken and any dissemination of information to operating organisations was not followed Up.

Two earlier accidents at RBMK reactors, a fuel channel failure at Leningrad-1 in 1975 and a fuel failure at Chernobyl-1 in 1982, had already indicated major weaknesses in the characteristics and operation of RBMK units, according to SCSSINP. The accident at Leningrad-1 is even considered by some to have been a precursor to the Chernobyl accident. However, the lessons learned from these accidents again prompted at most only very limited design modifications or improvements in operating practices. Because of lack of communication and lack of exchange of information between the different operating organisations, the operating staff at Chernobyl were not aware of the nature and causes of the accident at Leningrad—1.

The most likely final event at Chernobyl seems to have been thee insertion of safety rods at a vital moment in the test, which worsened to a destructive level the conditions already prevailing. On the other hand, the RBMK design had set a number of other pitfalls for the operating staff, any of which could just as well have caused the initiating event for this or an almost identical accident, INSAG notes.

For its part, INSAG finds it difficult to say with confidence which particular weakness ultimately caused the accident, preferring to point out that a precise identification hardly matters when any of them could have done it.

Violations, or just mistakes?

Specific violations of procedures were identified in 1986 as major causes of the accident. INSAG—7 corrects the apparently false impression given about a number of them. In particular:

- The statement that there was a proscription on continuous operation of the reactor at power levels below 700 MWt was wrong- There should have been such a proscription, but there was none at the time.
- In INSAG-1 it was stated that operation with too low an Operating Reactivity Margin (GRM) was a violation of requirements. In recent deliberations, INSAG has in fact questioned the ORM concept.

It was stated in INSAG-1 that, at the time of the test, three components of reactor protection had been disabled at Chernobyl. INSAG-7 points out that disabling of the Emergency Core Cooling System (ECCS), which happened 11 hours before the accident, was not prohibited under normal procedures at Chernobyl. In fact, INSAG understands that it was a requirement of the test schedule. Disabling of the trip on the steam drum water level would have been allowable; however, it did not occur. Disabling of the "two turbines' trip was allowed, and indeed was required by normal procedures at low power levels. In any event, the occurrence of this trip might well only have caused the destruction of the reactor sooner rather than later.

In general, INSAG concludes that the accident can be said to have flowed from deficient safety culture, not only at the Chernobyl plant, but throughout the Soviet design, operating and regulatory organisations.

Andrew Cruickshank
ATOM March/April 1993

The recurrence of fires in Indian nuclear plants clearly show that the Indian design, operating and regulatory organisations are as deficient in safety culture as their counterparts in the Soviet Union at the time of Chernobyl.

When Experts Utter Unpalatable Truths Change the Experts

"Speak the truth, but speak that truth which is pleasing to the ears! is an old Sanskrut saying. Nuclear experts at Pace University in U.SA. must be feeling that it would have been better if their 'classical' education had included a course in old Sanskrut.

In the wake of Chernobyl, Pace University had been commissioned by the U.S. Department of Energy (DOE) to do a study to determine the health and environmental costs to a community of nuclear power production. However, now that these experts have found that the costs are much higher than the 'officially approved numbers', the DOE and Federal Energy Regulatory Commission (FERC) have both cried foul and have oriticized the study in rather harsh Ianguage.

What both the report's authors and critics agree on is that almost all of the external costs associated with nuclear power are associated with reactor accidents rather than normal plant operation. (They ought to read the last issue *o{Anumukti* on Rawatbhata—-Editor.) Where there is strong disagreement, however, is in estimates of the scale of costs associated with the Chernobyl accident - the benchmark upon which the report is based - and the likelihood of a similar accident occurring in the U.S.

The Pace report estimates that the likely frequency of a Chernobyl-ocale accident is 1 in 3300 reactor years. (Since there are already over a hundred reactors operating in the US for well over twenty years, they have accumulated over 2000 reactor-years of experience.) The DOE on the other hand, feels that the chance of a Chernobyl scale accident in US is less than 1 in a million reactor years—a figure 300 times lees than that arrived by Pace experts.

Long experience with sometimes recalcitrant experts have taught DOE never to have just one set of experts to do a study. Thus, it is no surprise that two other studies have simultaneously emerged from Organisation for Economic Cooperation and Development's (OECD) Nuclear Energy Agency. This OECD report puts this figure in the middle at 1 in 100,000 reactor-years. In a note included in the report, the chairman of the OECD report said that the principle reasons for the differences between the Pace and their studies was that the University analysis looks at the existing US situation rather than modern plant options (for both nuclear and fossil fuel plant).

In addition, DOE argues that by failing to take into account updated data on the radioactivity releases from Chernobyl, Pace estimates on fatalities are more than what would actually occur. Richard Ottinger, one of the Pace report's principal authors, has accused the DOE "of playing politics with science".

These studies are being conducted since the US nuclear power industry is desperately trying to revive itself by doing an integrated resource plan. The attempt is to show that everything considered nuclear power is a less environmentally harmful source of future electricity than alternative options. Following the controversy, Federal Energy Regulatory Commission has urged state regulators to postpone efforts to take on board external costs in their integrated resource planning until after a DOE/European Community study has been completed later this year.

Based on a report in
Atom March/April 1993

Another Blot on the Russian Landscape

This April, when the Western media first carried coverage of an 'accident' in a re~~processing~~ plant at a mysterious place in Russia called Tomsk-7, we could be ex~~cu~~sed for thinking the event was no more than a minor hiccup in a decrepit weapons complex and of little or no importance for the nuclear industry worldwide.

Newspapers said that there had been an explosion in a tank 'containing an industrial uranium solution' and the event was a '3' on the International Nuclear Event Scale (INES) (Same as Narora fire) implying virtually no offsite contamination. For comparison wo ware reminded that Chernobyl waa a 6 or 7.

What we were not toia for some time was that the Tomsk-7 plant is a vast, sprawling complex, the size of Paris'. Technically, 'no off-site consequences' on a site this big are entirely consistent with hundreds of square kilometres of on-site contamination! Nor were we told that the blast took place during the reprocessing of spent nuclear fuel from military production reactors.

Up to 100,000 'people work at the complex, a* military 'closed city' 15 km from the oity of Tomsk' in Siberia, 2,700 km east of Moscow. Its inhabitants enjoy a relatively privileged existence, immune to the problems of price rises and unemployment that trouble other Russians. According to one report in the New Scientist, "Unlocked Mercedes stand outside houses, wages are high and the shops are full all year round with bananas and other goods unimaginable to the ordinary Russian."

By 1990, Tomsk is thought to have produced about 60 tons of plutonium using reactor fuel from Chelyabinsk. When the military production reactors at Chelyabinsk shut down in the late 1980s, the volume of spent.fuel being reprocessed at Tomsk fell considerably, but in 1991 commercial reprocessing contracts were concluded with France and South Korea.

Russia is awash with the world's largest stockpile of plutonium, estimated at 180 tons, of which 150 tons are,—or were — for military use, and is nominally committed to nuclear non-proliferation, yet it continues to reprocess and separate plutonium at Tomsk, Chelyabinsk, and Krasnoyarsk.

In January 1993, the deputy Minister for Atomic Energy, Viktor Siderenko, announced that Tomsk was to be the disposal site for plutonium from warheads destroyed under the START treaty. The idea was to make the weapons-grade plutonium into grapefruit-sized balls, then wrap each ball in boron-impregnated plastic, place them four at a time into argon-filled steel containers, then stack the containers 14 metres deep in concrete lined basins covered by massive concrete roofs, Strong enough to withstand a direct hit by a nuclear weapon*. However, the programme was officially vetoed by the Tomsk regional parliament months before the accident.

The explosion apparently occurred during an otherwise routine process late in the reprocessing cycle in which uranium and plutonium is extracted from spent fuel. This involves the addition of nitric acid and organic solvents to a solution of dissolved spent fuel. As it involves several stages, and because heat-producing chemical reactions happen when nitric acid is added to anything containing organic solvents, it has to be carefully monitored.

When government experts examined instrument records, they found that senior shift operators at Tomsk "had not monitored the concentration of nitric acid and had added too much, which had led to the explosion. As well emergency relief valves that should have opened were closed.

The explosion happened when two out of three of the extraction cycles had been completed and' large quantities of very highly radioactive fission-products already removed. It blew the top of the underground stainless steel and concrete tank in which the blast occurred, and led to a fire that burned for one and a half hours before it was extinguished.

Sources at the Tomsk plant later acknowledged that quality control there was a problem, and that at least three similar explosions had happened during the 1960s. But officials claim that safety standards were better in the past before cuts in wages and funding.

Reports about the extent of contamination from the explosion have been contradictory. A north easterly wind was blowing'at the time and Greenpeace claims Russian air force pilots picked up a plume of radiation traveling at an altitude of 3000 metres in that direction. An area of about 120 square kilometres of forest and mountain is said by another source to have been contaminated. Reports from Tomsk indicate that iodine was administered in some villages, and there was confusion and panic with people trying to flee the *city*,

Friends of the Earth UK claims the International Atomic Energy Agency has never carried out any safety inspection of Tomsk, and that it was officially notified of the explosion only 12 hours after it had heard media reports. The IAEA has no powers to inspect installations such as Tomsk-7 or Hanford, Sellafield, La Hague, Marcoule or BARC in Bombay and it has "no knowledge" of safety systems at Tomskr-7.

In the immediate aftermath of the accident, all reprocessing activities at Tomsk were halted but plant officials said the plant would go on line again 'in a few weeks'.

However, there are more far reaching consequences for the siting of the proposed plutonium storage facility. On the day of the accident, the regional parliament had rejected a motion by environmentalists to hold a public referendum on the future of the Tomsk-7 complex by a margin of five votes. The explosion has changed the political environment. The referendum is expected to be re-launched.

Chernobyl, Chelyabinsk and Tomsk are not the only household names in the nuclear lexicon of the former Soviet Union. In Voronezh, where the first Soviet nuclear power plant was built, there are reports of people stealing and drinking radioactive alcohol used for flushing out the cooling system. As a result of numerous radioactive spills, the soil in the area is almost as' contaminated as that around Chernobyl and yet Voronezh potatoes can still bebought at any market in Moscow.

Bated on *an article* by: John **Holam**
The Third Opinion Autumn 1993

Nagarjunasagar or Srikakulam
Atomic Threat Remains Potent in Andhra

Recently we received a letter forwarded by Mr Batu Sahgal, editor of The Sanctuary Asia magazine. It Was a letter from Mr Kamal Nath, Minister for Environment & Forests. At the same time we also received a letter from Ms Indira Vijaysimha-a reader from Bangalore—forwarding a letter to her from an NGO in Orissa and requesting help with regard to information regarding nuclear power plants. We publish both these letters together since they show that even after organised protest, (as happened at Nagarjunasagar) nuclear threat does not vanish. It just threatens next door.

Kama! Nath
Minister
Environment & Forests
INDIA

D.O.No. 11018113 /85-Env.5-IV
7 May 1993

Reference is invited to your letter of 16 March, 1993 conveying your concern for the proposal to set up a Nuclear Power Plant at Nagarjunasagar which happens to be a Tiger Reserve.

I may inform you that the Ministry of Environment & Forests has not approved the site.

Kamal Nath

Samman
Bhimsagiri, Dist: Ganjam 761066
Orissa

You must be aware that the Government of India is planning to set up a nuclear power plant, reportedly for power generation at Ranasthalam in the Srikakulam district of Andhra Pradesh. Radiation from the plant, we have been told will affect the human population and the environment in a radius of 170 km.

Unfortunately, we are woefully short of information regarding nuclear power plants. Could people involved in the antinuclear struggles elsewhere send *US* material that would be relevant to our situation? We would also like to network with other antinuclear groups within the country.

Ungia Panda

The Coming Battle

Orissa, the theater for some powerful people's movements in recent times, is gearing itself up to wage another significant one on the southern-most fringes of the state.

The proposal to put up two nuclear reactors of 500 MW capacity each at Ranasthalam in Srikakulam district, will pose grave danger to life and environment of a vast area in Orissa and Andhra. The major towns lying within a radius of 100 miles of the proposed site, include Viaakhapatnam, Vizianagaram, Berhampur, Jeypore, Rayagada, Koraput, Anakapalli, Tuni, Parlakhemundi and Gunpur. Apart from these towns, significantly, the eco-eenaitive Mahendragiri biosphere falling in both the states would be directly affected by radioactive pollution.

Many people and organisations have decided to oppose the project. Samman, a Berhampur based voluntary organisation in Orissa engaged in safeguarding the eco-system of Mahendragiri-Kerandimal mountain range and COPDANET (Coastal Poor Development Action Network) in Andhra Pradesh have taken the lead in spearheading the opposition.

Plans have been already drawn up for a mass awareness campaign and a padayatra through the region likely to be affected by the proposed plant. What is agitating the people of the area most is the prospect of a total devastation of the fragile Mahendragiri forests already ravaged over the years by rapacious timber merchants and shifting cultivation. The climate of this region is governed by the Mahendragiri forest reserve-home to some of the rarest species of orchids and having a bio-diversity of bewildering variety.

While the specter of a Chernobyl kind of nuclear disaster is fresh in the minds of the people what causes more alarm is the radiation hazards which are routine in normal operation of a nuclear reactor. Another cause for real concern is the large amount of radioactive wastes generated by the plant According to T. Shivaji Rao. emeritus in environmental engineering of Andhra University, Waltair, the notion of safety dose propagated by Department of Atomic Energy is a "myth". The activists in Andhra as well as Orissa have been using Shivaji Rao's study on the hazards of nuclear plant as the manifesto for their movement. Supporting Rao's contention they have been demanding the right to information and decision- making for the people under Article 48(A) and 61(A) of the Constitution.

The opponents of the Ranasthalam nuclear power plant have another significant objection. Such projects of 'development', only help the rich and the strong. The only real beneficiaries of such plants are contractors, suppliers, the politicians and the officials."

Srimoy kar
Indian E*xpress* February 6 1993

Sources of Contamination of RAPS Workers

I refer to Rawatbnata (Special Issue, Anumukti, Vol 6. No.5, April/May 1993). The value of your excellent study would have been greatly enhanced if you had included very important data on the functioning of the Rajasthan Atomic Power Plant since its inception. There have been various design, operational and maintenance shortcomings which could have resulted in greatly enhanced radiation exposure to workers and public alike. These are documented in a publication entitled *Third National Symposium on Operating Experience of Nuclear Reactor* and Pouter Planls (198)* brought out by Bhabha Atomic Research Centre and the Department of Atomic Energy. I list a few of these instances bordering on criminal negligence and irresponsibility.

Enormous fuel failure rates went unchecked for many years.

Because'of a lack of confidence in their own instruments for an unspecified number of years, RAPS authorities disregarded indications of fuel failures. This, by their own admission resulted in greatly enhanced exposure to workers and the public.

Workers had to frequently enter restricted areas while reactor was on-power, because of frequent breakdown of the adjuster rod control mechanism.

Exposure to heavy radiation of workers due to faulty pressure relief devices.

There are blow-out panels at various locations in a pressurised heavy water reactor used for relieving pressure. (Much like a safety valve in a pressure cooker-Editor.) This blow-out panel is sealed with an adhesive tape at **RAPS. The sealing effect is lost after sometime as the tape unglues. This results in a release to the atmosphere of tritiated heavy water. Workers in the area are exposed to radiation due to this tritium. Since the adhesive tape requires frequent replacement, this activity too exposes workers to additional radiation.**

- Seventeen categories of major incidents involving on-line fueling machine have been described in an article by Mr Dileep Bhatia in the reference cited above. These involved manual handling of irradiated fuel bundles. These fueling machine failures also involved several station shutdowns.
- The notorious south end shield which protected workers from heavy radiation cracked in 1981 and tenaciously refused to be effectively plugged. Attempts to repair this shield resulted in additional cracks. Despite the vehement assurances of Mr S. L. Kati that you have quoted in your paper, the years spent in trying to rectify this problem did. result in heavy radiation doses.

No wonder your data about the proximate villages reveals the horrifying extent of the multidimensional tragedy.

R. Ashok Kumar. Negentropist
Bombay Sarvodaya Mandol
Bombay

Subscription Information

Rs. 30/- per year (6 issues) South Asia
U.S. $ 16/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, 394 641 India

Please do not send personal cheques or drafts addressed to Surendra Gadekar

Anumukti Team:

R. Ashok Kumar, P. P. Baburaj, Sanghamitra and Surendra Gadekar

Published by Surendra Gadekar for Sampoorna Kranti Vidyotaya and printed at The Parijat Printery, Ahemdabad

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 7 Number 1 August/Septemter 1993

Weapons Junkies

What has been Americas most nurturing contribution to the culture of this planet so far? Many would say jazz. 1, who love jazz, will say this instead: Alcoholics Anonymous.

I am not an alcoholic. If I were, I would go before the nearest AA meeting and say, "My name is Kurt Vonnegut. I am an Alcoholic." God willing, that might be my first step down the long, hard road back to sobriety.

The AA scheme, which requires a confession like that, is the first to have any measurable success in dealing with the tendency of some human beings, perhape ten percent of any population, to become ad*dieted to substances that give them brief spasms of pleasure, but in the long term transmute their lives and the lives of those around them to ultimate ghastliness.

The AA scheme, which, again, can work only if the addicts regularly admit that this or that chemical is poisonous to them, is now proving its effectiveness with compulsive gamblers, who are not dependent on chemicals from a distillery or a pharmaceutical laboratory. This is no paradox, Gamblers, in effect manufacture their own dangerous substances. God help them, they produce chemicals that elate them whenever they place a bet on simply anything. If I were a compulsive gambler; which I am not, I would be well advised to stand up before the nearest meeting of Gamblers Anonymous and declare, "My name is Kurt Vonnegut. I am a compulsive gambler''

Whether I was standing before a meeting of the Gamblers Anonymous or of the Alcoholics Anonymous, 1 would be encouraged to testify as to Row the chemicals I had generated within myself, *or* swallowed had alienated my friends and relatives, cost me jobs and houses, and deprived me of my last shred of self-respect.

I now wish to call attention to another form of addiction, which has not been previously identified. It is more like gambling than drinking, since the people afflicted are ravenoum for situations that will cause their bodies to release exciting chemicals into their bloodstreams. I am persuaded that there are among us people who are tragically hooked on preparations for war. Tell people with that disease that war is coming and we have to get ready for it, and for a few minutes there they will be as happy as a drunk with his martini breakfast or a compulsive gambler with his paycheck bet on the Super Bowl.

Let us recognize how sick such people are. From now on, when a national leader, or even just a neighbor, starts talking about some new weapons system that is going to cost us a mere twenty-nine billion dollars, we should speak up. We should say something on the order of, "Honest to God, I couldn't be sorrier for you if I'd seen you wash down a fistful of black beauties with a pint of Southern Comfort." I mean it. I am

not joking. Compulsive preparers for World War 3, in this country or any other, are as tragically and repulsively addicted as any stockbroker passed out with his head in a toilet in the Port Authority bus terminal.

For an alcoholic to experience a little joy, he needs maybe three ounces of grain alcohol. Alcoholics, when they are close to hitting bottom, customarily can't hold much alcohol. If we know a compulsive gambler who is dead broke, we can probably make him happy with a dollar to bet on who can spit farther than someone else. For us to give a compulsive war-preparer a fleeting moment of happiness, we may have to buy him three Trident submarines and a hundred intercontinental ballistic missiles mounted on choo-choo trains.

If Western Civilization, which blankets the world now, as far as I can tell, were a person—if Western Civilization, which surely now includes the Soviet Union and China and India and Pakistan and on and on, were a person—we would be directing it to the nearest meeting of War Preparers Anonymous. We would be telling it to stand up before the meeting and say, "My name is Western Civilization. I am a compulsive war-preparer. I have lost everything I ever cared about. I should have come here long ago. I first hit bottom in World War 1".

Western Civilization cannot be represented by a single person, of course, but a single explanation for the catastrophic course it has followed during this bloody century is possible. We the people, because of our ignorance of the disease, have again and again entrusted power to people we did not know were sickies.

And let us not mock them now, any more than we could mock someone with syphilis or smallpox or leprosy or yaws or typhoid fever or any of the other diseases to which the flesh is heir. All we have to do is to separate them from the levers of power, I think

And then what? Western Civilization's long hard trip back to sobriety might begin.

Kurt Vonnegut Jr
The Nation January 7. 1984).

I From the Editor's Desk

Recently, there has been unusual interest in the Nuclear Nonproliferation Treaty (NPT) amongst commentators and think-tankers in India. Some have advocated that India should declare itself a full-fledged nuclear weapons state and join the treaty in that capacity. However, the debate has totally missed a most vital point.

NPT is based on false premises. When the treaty was first signed (July 1st, 1967), the nuclear haves asked the nuclear have-note to forgo their sovereign right to make nuclear weapons. In return, the have-nots were promised the following:

- The nuclear haves were to 'seek* a comprehensive test-ban treaty and discontinue all (underground) nuclear weapons' tests.
- They were to negotiate among themselves with an aim to 'pursue' "in good faith" efforts towards reductions in their own arsenals.
- They were to refrain from threat or use of force on non-nuclear states in accordance with the U.N. charter.
- They were to cooperate in contributing to the further development of the application of nuclear energy for peaceful purposes including any peaceful applications of nuclear explosions.

Discussion on NPT in India has tended to concentrate on the failure of the nuclear haves to implement the first three points. There has been little or no discussion regarding the fourth point.

The experience of the last 25 years of "application of nuclear energy for peaceful purposes' has shown that nuclear energy is a poisoned source of power and its use has to be abjured by all if we are to preserve the planet for future generations. The sufferings of the people of Kazakh istan and the Pacific bear ample testimony to the 'benefits' of 'peaceful nuclear explosions'.

No self-respecting state can sign the NPT. India has no need to emulate others who have done so. Of course, it is moot question whether India is any longer a self-respecting nation which can make up its own mind on issues of vital concern. But not signing a patently discriminatory treaty does not mean that we should continue the present bankrupt policy of nuclear ambiguity.

Nuclear weapons are weapons of mass destruction. Their use or threat of use is only to terrorise the adversary. States possessing these weapons are truely 'terrorist' states. The correct way for other countries in the world community to deal with these bullies is to recognize them for what they are and to ostracize them. One certainly can not deal with terrorism by aspiring to become a terrorist oneself.

August 6 and August 9, 1945

Lest We Forget

Images of Hiroshima

An eighty-year-old woman of Mitaki township in Hiroshima lost her husband in the "flash" of the bomb; day and night she still tells her grandson Tomekichi the "flash story/' like a thread woven in childhood.

It was just like hell—a procession of ghosts, a sea of flames. But I didn't see the devil, so I thought it was something happening on this earth....
An atomic bomb doesn't just fall; someone has to drop it.

In the central bombed area, there were "two feet of a victim whose body had vanished in a single puff; they stood upright, stuck to the concrete road. Again, strangely, "in a streetcar a young girl lay dead, head to head with a dead, charred-black soldier; uninjured but with torn clothing, she still clutched her purse." But, "not a soul remained to tell us what happened at the center of the bombed area."

In the pond of the Sentei (Asano Mansion), live carp were swimming among the dead bodies.

When I came to my senses, I found my comrades still standing erect and saluting; when I said, "Hey," and tapped their shoulders, they crumbled down into ashes.

Food was distributed to the A-bomb victims. An old woman's grandchild was standing in line to receive rations. "In front of my grandchild, there was a young near-naked girl. After receiving rations for five persons, she fell forward on the ground and lay motionless/*

In the home of a sick soldier, his young wife was crushed between large, heavy beams, still holding her child in her arms. A man from next door tried to rescue her, but the beams were more than one man, or even two, could lift. Wanting to save her child at least, he cried, "Quick, give me the baby."But she said, "No, let us die here together. My husband is already dead, anyway. I can't leave this child alone. ..Hurry up! Escape while you can."

A mother in Mitaki township, who lost her husband in the atomic bombing, carried on her daily work valiantly; but on her arm where skin from her hip had been transplanted, the scar tissues continued to contract in autumn and winter, causing intense pain.

Everyone gathered at some stone steps and sat down. They included a woman losing her sight in one eye, a man getting sicker by the minute, another with a fierce headache. Everyone had external and internal injuries, but no one cried out in pain. Almost everyone was silent

It was a cruel and complete silence, worse than any other, like "a moan that cannot be voiced."

1 ran to wan! Tsurumi Bridge, jumping over stones and fallen trees as though I were mad. What did 1 see there? Countless people were struggling to get to the stream under the bridge. I could not distinguish men from women Their faces were swollen and gray; their hair stood on end. Then, raising both hands skyward and making soundless groans, they all began jumping into the river as though competing with one another.

The concrete wall opposite me had big, gaping holes in places. 1 approached it because some low, dark figures seemed to be sitting in a row at its base. I could hardly tell man from woman or child, nor could I distinguish their ages They were all but nude, sitting in a line, and their faces and bodies had swelled up and turned brown, as if by common consent. One had already become blind. Then I noticed a baby on someone's knee; the skin of its back was hanging down, as if a rotten, reddish loquat had been peeled off all around. Instinctively, I turned away from the sickening sight. They were all motionless and kept a strange silence. It seemed that the question of life and death was yet unsettled for them. I shuddered at the thought of being loaded on a truck with these people.

Soon she lost consciousness. When, a full day later, she regained consciousness, a new realization swept over her: "I'm blind." / tried to raise my hands, but my right hand was heavy and beyond my control. With the fingers of my left hand I touched my face lightly; my eyebrows, my cheeks, and my mouth felt like a mixture of bean curd and gelatine. My face was swollen, like a big sponge; it was as I had no nose. I shuddered as I suddenly remembered the spooky shapes at the foot of the concrete wall."

The other side

For my part, however, I was within 1.5 kilometres of the hypocenter at bombing time and suffered only slight exposure symptoms, and am at present in relatively good health. Morevoer, my parents, my wife — who at that time was a second year student in a girls' high school and was equally exposed to the bomb — and my three children born in the decade 1955-1965 are all in good health. I therefore tried to be as optimistic as possible, so long as no further ill effects appeared.

I have long wondered why virtually all of the "A-bomb literature" consists of stories of the miserable people who have not recovered their health, as well as the descriptions of radiation symptoms and psychology of the A bomb survivors.

Why are there no stories of families who endured hard times, but recovered their health and now live as normal human beings? Must all survivors eventually meet a tragic death caused by radiation aftereffects? Is it not possible for the victims to overcome their illnesses, and their psychological anxieties and die a natural death like other people? Musfour deaths be used as data for opposing atomic bombs?

Undeniably, our lives were distorted and tormented by the bomb. Yet many other people, though they did not experience the atomic bombings, nonetheless endured the war and knew suffering of varying degrees. Therefore, I am determined not to indulge myself in the victim complex that some victims in Hiroshima have developed. I want my body and soul to recover.

**From Hiroshima Notes
by Kenzaburo Oe (1965)**

Unabated Suffering

Hibakusha is the Japanese word for the atomic bomb survivors. This article which has been excerpted from a long paper presented at the IInd Radiation Victims Conference at Berlin last year details their present suffering.

We questioned 1233 Hibakusha whose mean age was 59.5 years, 1985-90. According to our investigation of the Hibakusha, more than 50 percent of those surveyed underwent repeated hospitalisation. More than 90 percent of those surveyed were under treatment at the time of the survey which was two and a half times higher than the standard rate for other Japanese of the same age group. Incidence of lumbago (28.4% among the Hibakusha) is 3.6 times higher than the corresponding standard, hypertension (23.9%, 1.7 times), ocular disease (18% 5 times) neuralgia and myalgia(12.3%, 4.7 times), anemia and leukopenia(12.1%, 13.4 times), gastritis (9.9%, 4.5times), gastroduodenal ulcer(9.8%, 4.7 times), ischemic heart disease (9.8%, 4.7 times), liver disease (9%,6.4 times), diabetes (8.2%, 2.7 times) and others are relatively high, as well as high incidences of cancer and leukemia that are well known to be caused by radiation? These higher incidences strongly suggest that such general diseases are related to the radiation exposure of the A-bomb.

The high incidences of medical treatment found in the Hibakusha of Hiroshima/Nagasaki cannot be explained by mere stress. The high rate should be regarded as an indication that they were really ill because of radiation exposure.

We find similar results to ours indicating high incidences of diseases like hypertension and liver disease other than cancer and leukemia, in investigations undertaken by other groups previously. In a paper undertaken for "the NGO's symposium on the problems of the Hibakusha, 1977", the authors investigated 715 Hibakusha and reported the higher incidences of disorders of blood and Bone mar-

row, circulatory system, gastrointestinal system, and skin and subcutaneous tissue, compared to the general Japanese people. The incidences of these diseases are higher especially among the Hibakusha who had acute radiation injuries. In another investigation undertaken during 1985-86 by the "Japanese Council of Hibakusha", 13169 Hibakusha were investigated whose mean age was 62. The result indicated that the incidence of arthritis, lumbago, and rheumatism (41.3% among the Hibakusha, 3.9 times higher than general people), hypertension* and ischemic heart disease (36.5%, 2.3 times), cataract and ocular disease (20%, 5.6 times), skin disease (17.9%, 10.5 times), blood disease (17.5%, 19.4 times), gastroducdenal ulcer (14.9%, 10.5 times), liver disease (14.8%, 10.6 times), and diabetes (12.3%, 4.1 times) were high among the Hibakusha.

Moreover, statistics from 1968-82 about the cause of death of survivors of Hiroshima show that the number of deaths due to general health disorders such as tuberculosis, diabetes mellitus, blood/bone marrow disease, hypertensive disease, and liver cirrhosis are significantly larger among the Hibakusha, compared to general population.

Genbaku Bura-Bura disease

Many Hibakusha have frequently complained of such subjective symptoms as tiredness, vertigo, palpitations, lumbago, back pain, stiff shoulders and neck pains. These symptoms have collectively been called "Genbaku (atomic bomb) Bura Bura (lingering) disease." We believe that this is an important syndrome that should be regarded as a result of radiation exposure: A similar syndrome was reported also among the Chernobyl children.. These symptoms should not be ignored by ascribing them to mere stress.

Characteristics

The lingering disease consists of many symptoms that indicate a general damage of physiological functions. Characteristics are divided into various categories: general symptoms such as tiredness and fatigue, indication of damage to the immune system (easy to catch colds, etc.), those of the autonomic nervous system related to the control of whole internal organs, including the circulatory system (vertigo, palpitations, etc.) and those of the nervous and motor systems (stiff shoulders, neck pains, headache, lumbago, back pains and numbness of limbs). Our survey of the history of the disease and lives of the Hibakusha showed that the appearance of the symptoms in the period of a few to 10 years after the A-bombing is somewhat different from that at present. The lingering disease in the early stages was more severe than now, and, in extreme cases, symptoms suddenly becomes so serious that patients were bedridden. Such cases are rare, and the symptoms seem to be chronic today. We are taking medical care of the Hibakusha in our hospital and we ofteh see among them health disorders showing such conditions as, liable to catch colds", "susceptible to illness", and "difficult recovery from ill health".

Correlation between symptoms and radiation exposure

The following finfling* suggest a correlation between symptoms and radiation exposure:

- The rates of subjective symptoms found among the Hibakusha are higher than those found in the general population.

- Those who suffered acute. symptoms after the A-bombings (i.e. those who received high doses), show a higher level of bura-bur a symptoms.

- Similar symptoms are common among nuclear power plant workers exposed to radiation.

- Similar symptoms are seen among radiation victims in other countries.

Total Neglect

The name of the syndrome, bura-bura disease, reflects the fact that most hibakusha always felt very lethargic. Because many of them looked healthy enough on the outside they were regarded as habitual malingerers and discriminated against by the socity. Many committed suicide to avoid the stigma and after repeated rejections in the marriage and job markets. The Japanese government did not provide any financial or medical support to the Hibakusha for more than ten years after the atomic bombings. It was only after a public movement that a law giving relief to the Hibakusha was enacted.

Never Ending Saga

A health survey of the second generation of the Hibakusha in Nagasaki revealed high rates of sickness. The mean age of the group of 1023 persons investigated was 31 years. 22.8% said that they were taking treatment for some disorder at the time of the investigation which is twice as high as the rate in the general population of the same age group.

We demand that a "national compensation law" be enacted for the Hibakusha including the second and third generation victims. We want to join hands with the world wide movement of radiation victims.

Of Katsumi Funstu, Kazue Sadamori.
Masako inornata, Dr Saburo Murata
Haman ChuoHospital

August /
September 1993

The Price of Greatness

The author of this article, Sam Day ***is a person with an immense am mount of common sense. Although at first*** *glance this article has very little to do* ***with Anumukti, we are reproducing it in full since the mindset it describes,is*** *not confined to U.S. alone but applies equally* ***well to the people*** *in* ***the corridors of power in Delhi. Happy would be*** *the day when we in India would give up* ***notions*** *of* ***being a regional power and look deeply into what constitues real*** *greatness.*

Studente, professors and practitioners of American foreign policy often use the term "Great Power" in referring to the role of the United States and a few other nations on the world stage. They think of this country not only as a Great Power but as the last remaining Superpower.

I was reminded of this by Secretary of State Warren Christopher's explanation of the Clinton Administration's decision to involve the United States in settlement — including use of ground troops, if necessary — of the war now ravaging what used to be Yugoslavia. No Great Power, said Christopher, could stand aloof from conflict or instability in such a strategic part of the world.

What is a Great Power, I wondered. What distinguishes the great power of U.S.A. from the lesser power of the other nations? What does it mean to be a Great Power, and what are the costs and benefits of this special status?

Being citizens and taxpayers of Great power, it seems, means that Americans—rather than, say, New Zealanders—get to kill and be killed in separating the blood-feudere in Europe's ancient Balkan tinderbox.

It means that Americans—rather than, say, Swedes get to continue picking up the $50-billion a year U.S. share of the tab for maintaining the North Atlantic Treaty Organization (NATO), the base for the military operations in Europe and the Middle East as well.

It means the United States and not the Dutch or Canadians or Cubans, get to send our carrier battle groups and floating marine battalions to the Adriatic Sea, the Indian Ocean and the Persian Gulf to ensure stability in those far-flung regions.

It means the United States, not Japan or Australia, gets to fly the flag and carry a big stick at Singapore, where Britannica once ruled the waves at the crossroads of the Far East.

For Warren Christopher and others in the foreign policy establishment there are obvious benefits from being a Great Power. In foreign ministries a representative of the United States carries a bit more clout than someone from Denmark or Belgium.

Two other categories of beneficiaries come to mind. Materially, there is the military-industrial complex, which depends on the hundreds of billions of dollars a year needed to nourish great powerdom. Spiritually, there is the satisfaction many derive from the sense of being associated with Number One.

What are the costs of being a Great Power? They have been encountered through the centuries by countries—Rome, Portugal, Spain, Britain—that rose and then collapsed as Great Powers, exhausted by the burdens of empire, For the United States today the cost are apparent in a crippling national debt, federal budget gridlock, deteriorating economic competitiveness, collapsing infrastructure, eroding social services...

Every lesser power cited above-New Zealand, Sweden, Holland, Cuba, Canada, Norway, Denmark, Japan, Australia, Belgium, Luxembourg—now leads this Great Power in the quality of the social safety net available to its citizens, child care, and protection of the old and infirm.

We have a lot to learn from these lesser but wiser powers—poorer in guns but richer in their quality of life about what really constitutes greatness.

Sam Day
Nukewatch

We have a lot to learn from the lesser but wiser powers—poorer in guns but richer in their quality of life—about what really constitutes greatness.

Uranium, Plutonium, Pandemonium

Two years ago, The Economist magazine from London was waxing eloquent about "the charms of nuclear power". The present article shows that even die-hard true blue tories are capable of appreciating reality when it comes and bludgeons them on the head. There are no easy answers to the dilemmas posed by nuclear power. Even. disarmament has a dark side. It sets free nuclear explosives that used to be tucked away in superpotver arsenals, and must now be disposed of

There are various recipes for making nuclear weaponry. Some can be carried out only by experienced master bomb makers. Others are easy enough for beginners to have a go at. All of them, though, contain ingredients—plutonium or highly enriched uranium (HEU)—that have always been very hard to come by.

It is the possession of these nuclear materials, more than know-how about their use, that separates, the Israelis from the Iraqis, or the Indians from the Iranians. Making them is hard, and requires the sort of efforts only rich countries or desperate ones will undertake. Even with money and will, a uranium-enrichment programme takes time to build, and might easily be detected by others. The cost of making materials for nuclear weapons, and the risk of being caught in the act, are the biggest obstacles facing countries tempted to gate-crash the nuclear club.

Mindful of this, countries with nuclear weapons have developed elaborate systems to guard plutonium and HEU. But the authoritarian mechanisms that guarded Soviet nuclear material can no longer be guaranteed. Nuclear smuggling is already on the increase. The number of reported cases rose to over 100 last year, compared with 35 in 1991. So far the contraband is low-grade stuff, from industrial sources, not weapon-grade materials. All the same, smuggling routes are being established that could serve more dangerous trades and customs authorities are beginning to be

> *Nuclear smuggling is already on the increase. The number of reported cases rose to over 100 last year, compared with 35 in 1991. There have already been more than 50 attempts to extort money from America with nuclear threats, some frighteningly credible.*

The mere possibility of a black market in weapon-grade material is terrifying. Instability would spread like a chain reaction. Countries newly unsure about their neighbours' capabilities would find themselvas ever more tempted to try to get a bomb themselves. Terrorist groups, kept from the nuclear game by their lack of industrial infrastructure could become players. Exploiting these fears, nuclear Blackmailers could make a mint. There have already been more than 50 attempts to extort money from America with nuclear threats, some frighteningly credible. The pex>ple who decide whether to believe them or not have been able to check their own stocks quickly, to make sure no bombs or material are missing. Such checks will be less reassuring if the world's supplies become more accessible and, alarmingly, less well documented.

The Soviet syndrome

The break-up of the Soviet Union has fractured the brutal certainties of the cold-war nuclear regime. Roughly 3,000 weapons in Ukraine, Byelorussia and Kazakhstan are now less firmly in the grip of the top brass in Moscow. Ukraine has been reluctant to honour it* pledge to relinquish its arsenal. Whether or not these, countries have nuclear ambitions, there are worries about security on their soil. One Russian officer in reported to have advised his western counterparts to "take seriously" rumours that three or four weapons have disappeared in Kasha kstan.

In Russia itself, the nuclear industry that once supported whole cities, such as Chelyabinsk east of the Urals, and Tomsk and Krasnoyarsk in Siberia, is facing a crisis. Grandiose Soviet schemes for nuclear power have been replaced by Russian realities. Thousands have lost their jobs. The chances of a foreign country finding a Russian engineer ready to sell nuclear advice or materials are growing.

Disarmament treaties between America and the former Soviet Union could further strain the regime for guarding weapons materials. Roughly six tonnes of plutonium and 30 tonnes of HEU are due to be released annually over the next 15 years as Soviet warheads are scrapped. Many western sources believe that there is no reliable overall inventory system to keep track of this material.

August (September
1993

All this is happening against the background of a worldwide accumulation of civilian plutonium. Plutonium is not found naturally on earth, but it is produced whenever uranium is used in a nuclear reactor. Military production reactors are designed to burn fuel in short bursts and thus maximise the production of a particular isotope of plutonium,^{239}Pu. Civilian reactors, designed to produce power, use their fuel for longer and so produce heavier isotopes, ^{240}Pu and ^{241}Pu. To get the plutonium into a usable form, the fuel has to be "reprocessed".

The bombs in today's stockpiles contain almost pure ^{239}Pu. The other isotopes mess up the workings of the nuclear reaction. But isotopically impure plutonium produced in civil reactors can be made into bombs; American scientists at Los Alamos National Laboratory have tried it, and it worked. According to Frank Barnaby, once director of the Stockholm International Peace Research Institute,'it takes about 35 kg (77 Lb.) of civil plutonium in its oxide form to make a bomb, whereas a mere 5 kg of good military metal will suffice. Despite being larger, bombs made from civil plutonium will have low, unpredictable yields, especially if inexpertly designed and assembled. But terrorists do not need the power, precision and elegance of a high yield weapon that fits on a missile. Low-yield bombs in lorries could serve their purposes, demolishing a fair fraction of a city and spreading fall-out far and wide.

Gelger counter

The first convincingly reasoned inventory of the world's nuclear material was published earlier this year. Working from a variety of sources, public and private, the authors conclude that there are roughly 1,000 tonnes of plutonium and 1,500 tonnes of HEU. Because of the doubt attached to their estimates, they want all governments to publish their inventories and submit them to international supervision.

> ***Terrorists do not need the power, precision and elegance of a high yield weapon that fits on a missile. Low-yield bombs in lorries could serve their purposes, demolishing a fair fraction of a city and spreading fall-out far and wide.***

At the moment, international supervision is woefully limited. Only *1%* of the world's HEU comes under the safeguards administered by the International Atomic Energy Agency, that is mostly used to power small research reactors in countries that have no nuclear weapons. Almost all the rest, 95% of the total, is held by the American and Russian armed forces. It is not all in weapons; as much as 100 tonnes of Russian HEU is used simply to power ships and submarines. A tiny fraction of this amount could be the basis for a successful third-world weapons programme. A mere 130-220 kg of HEU, accumulated in its own enrichment programme, has made Pakistan a nuclear power. This is 0.01% of the world's total stock.

By contrast, most of the world's 1,000 tonnes of plutonium are in civilian hands-though only 30%, that in Britain, France and the non-nuclear states, is under international safeguards. More than half of this plutonium is sitting in used fuel-rods from commercial reactors, unusable for anything until it is reprocessed. But stocks of civil plutonium are flowing forth from reprocessing plants ordered during the 1970s. These plants were supposed to'provide fuel for a new generation of "fast" reactors which would burn plutonium, but neither the demand for nuclear power nor the performance of fast reactops has met the planners' expectations, and the cost of uranium fuel has dropped. Most of the reprocessed civil plutonium-7 2 tonnes-is sitting in storage.

And yet reprocessing will continue. Billion-dollar reprocessing plants have been built in Britain and France. It is hard to resist the pressure to use them, especially as some nuclear-power generators have tied themselves into long-term reprocessing contracts. When they did so, they hoped that reprocessing could cut the cost of disposing of nuclear waste. That claim has not been borne out for today's designs, but such contracts cannot easily be broken. So on current plans the reprocessing plants will separate an average of 21 tonnes of plutonium a year over the next 20 years. By 2010 a total of 545 tonnes of plutonium is due to have been separated. Most of this plutonium will be produced in Britain and France, though some could also be separated in Russia and possibly Japan.

When it comes to military plutonium, America and the former Soviet Union have the lion's share: some 250 tonnes between them. Again, small amounts can have striking political consequences-witness Israel and India with about 300 kg of plutonium each. Russia and America both say they need no longer make military plutonium. And yet, even as military production stops adding to the total amount of nuclear material in the world, plutonium and HEU from dismantled weapons will add to the stocks.

The danger of disarming

The former Soviet Union has mora bombs to dismantle-at least 33,000 weapons in all. The reason the Russians have so many is that fresh plutonium slowly undergoes radioactive decay, making it un-

predictable in warheads. America solves this by recycling old material, chemically extracting impurities, occasionally going so far as to make "ivory" plutonium, almost pure ^{239}Pu. As a rule, the Soviet Union did not refresh its plutonium. Aging weapons simply got put into reserve, replaced by warheads full of plutonium fresh from the reactor.

The differences in design account for some of the differences in safeguards. With most of the Russian plutonium in weapons, either ready for service or held in reserve, control of materials could be maintained by locking up bombs. In America, partly because of more recycling, safeguards depended more on full accounting for the nuclear materials themselves as they passed through the long and complex procedures. A greater distinction between the two systems of safeguards, though, lies in their psychology. The Soviet system, confident in its control over its own people, saw threats coming from outside. In America treacherous and corruptible insiders have always been seen as a potential danger.

The snag with disarmament, for all its other merits, is that it disrupts the established Soviet routine. The chart shows how much plutonium and HEU might be released from warheads if the INF and START disarmament treaties are implemented. Weapons will be broken open and the plutonium and uranium stockpiled or processed. This material will be passed to civilian inventories controlled by Minatom, the ministry of atomic energy; counting bombs will give way to accounting Cor material. There is no systematic connection between, the two inventories. Gosatomnadzor, the regulator which was given responsibility for civil and military materials last June, has been reftused access to some military invehtories.

The great bonfire

The HEU that gets to Minatom can, eventually, be burnt in commercial reactors. Uranium comes in two isotopes, 235U and 238U. It is 235U that releases energy; but 99.28% of natural uranium is 238U. For this natural uranium to be made more potent it must be enriched in 235U, which means sorting through the uranium and discarding some of the 238U. A little enrichment-to a 236U content of 2-6%-is good enough for most reactors, though some can work with unenriched uranium and some research reactors use highly enriched uranium. The HEU in weapons is usually enriched to 94% 235U.

Enrichment is hard, which is why bomb programmes are rare. Reversing it—diluting HEU by adding less enriched uranium—is easy, and America is making it profitable as well. America has agreed to buy Russian HEU diluted for commercial use. It is set to pay $780 a kilogram for material blended to a concentration of 4.4% 236 U, a price competitive with that of enriched fuel. A total of 500 tonnes of HEU will be blended into 15,000 tonnes of fuel, which makes the deal worth $12 billion.

The Uranium Institute, based in London, has calculated that the 816 tonnes of HEU that might be released from American and Soviet disarmament could take the place of 166,000 tonnes of natural uranium, roughly three years' worth of world demand. This is a headache for the world's uranium producers, which are already suffering from depressed uranium prices. For everyone else, though, it is a blessing: once blended, the uranium presents no more threat than any other nuclear fuel It would be no easier to enrich than any other reactor-grade uranium.

If only it were as simple for military plutonium. But the world has a surplus of plutonium, even without extra supplies coming from disarmament. And there is no commercial plutonium-fuel industry equivalent to the uranium-fuel industry into which diluted HEU so neatly feeds.

Many bright and failed ideas looking for a second lease on life-are being put forward as ways of converting weapons' grade plutonium into a form too awkward for the weapon-minded to bother with. One such scheme would mix the plutonium with nasty but useless nuclear waste and seal it in blocks of glass. Most of the rest would help pay for disposing of the plutonium by generating electricity from it while turning it into waste. France has thought about reviving *Superphoenix,* its experimental fast reactor, which was shut down after technical mishaps. General Atomics, based in San Diego, has floated a plan for a $1.5 billion helium-cooled reactor—a novel design it has long wanted to build.

There are other, more radical designs. One is a molten salt reactor. Liquid plutonium is squirted in, waste is siphoned off Scientists at Ios Alamos have suggested using particle beams to help burn up the plutonium, rather than relying entirely on particles given off by a chain reaction going on within the material; they think it would be like holding a flame underneath the plutonium, rather than starting a dangerous plutonium blaze.

A study of different ways to burn up plutonium by America's Lawrence Livermore National Laboratory came out against such cleverness, at least as far as using up America's surplus plutonium is concerned (though it did recommend more research into a few). Not only would these novel reactors take too long to develop, but the electricity that comes from them will, in most cases, be needlessly expensive. Instead the study

prefers a proven technology known as mixed-oxide fuel, or MOX,

The idea is to take plutonium and mix it with unenriched uranium. Since ^{239}Pu acts like ^{235}UJ, the end result is quite like the low-enriched uranium used as reactor fuel. The idea dates from the 1950s, when' it looked as if there would be plutonium left over from the fast-breeder reactors that were being planned—reactors which could produce more plutonium than they consumed. Under such conditions MOX made sense. If you have to pay to reprocess the plutonium from spent fuel, though, it does not. An OECD study in 1989 found it unlikely that MOX could compete with uranium under realistic circumstances. According to the fuel-cycle manager of a large German power company, it is twice as expensive as uranium. Even with free plutonium, MOX is unlikely to be cheaper than making uranium fuel from scratch unless uranium prices soar. Some MOX fuel has been made—the lack of an economic rationale has never stopped the nuclear industry trying things—but as yet it has used up only 12.5 tonnes of plutonium.

Now disarmament and reprocessing are bringing about what fast reactors never did: surplus plutonium. MOX would be a relatively safe way of disposing of the stuff. Moreover the Livermore study concluded that it would be easy to adapt designs for tomorrow's reactors so they could burn MOX exclusively—rather than a mixture, one-third MOX and two-thirds uranium, as is the practice today. Given free plutonium, the report says that such a plant could generate electricity at 3.1 cents a kilowatt hour (kwh), compared with 3.0 cents a kwh using uranium fuel in a standard reactor.

> ***"The lack of an economic rationale has never stopped the nuclear industry trying things"***

Unfortunately there is not enough capacity in MOX factories to turn the weapons surplus from both superpowers into fuel. And governments have not licensed enough MOX-burning reactors to absorb the plutonium coming from reprocessing plants, let alone tonnes of weapon-grade plutonium as well. According to the authors of the inventory, even the most optimistic projection — which, incidentally, takes no account of military plutonium — sees plutonium stocks growing from 72 tonnes in 1990 to 113 tonnes in 2000, before decreasing to 36 tonnes in 2010, as MOX fabrication and fast reactors take off.

•

As a matter of course, many will protest about shipping and flying civilian plutonium around the world in large volumes. Terrorists will not be among them. Some of the planned M@X factories will probably fail to get approval; reactors will be refused licences to load MOX into their cores. In Germany and Japan, where reprocessing nuclear waste'has been a requirement, using the plutonium **produced seems lees popular, several utilities are having difficulty securing licences to burn MOX. A projection that tries to take account of some of these factors sees civil plutonium stocks growing to 265 tonnes by 2010.**

The commodity from hell

The problem is not just that MOX reactors provide only a narrow channel for disposing of military plutonium, or that the channel will be clogged by the plutonium from uneconomic civil reprocessing programmes. It is that these programmes, and the plutonium economy they seek to bring into being, encourage the Russian nuclear industry to think of plutonium as valuable. Far from talking of the plutonium problem, desperate Russian nuclear engineers, encouraged by the plutonium industry in France and Britain, want to begin a new programme to build fast reactors running on plutonium, undaunted by difficulties the West has had with such technology.

Even if it were technically possible, Russia does not have the money to do it. The alternative, when plutonium is seen as a fuel, is to load it into existing Russian reactors, unused to the stuff and already regarded as unsafe by outsiders. Either way, as long as reprocessing plants make plutonium look like a commodity, the risk that the wrong people will buy it remains.

The Economist June 5,1993

! Letter Box

so great as to counter balance the great danger of radiation. If not, why take all this risk,

R. K. Patill
Civil lines
Nagpur

The article presented in **the** special issue on Rawatbhata (April/May 1993) is **systematic,** authentic and full of information-However, **I feel that no definite** conclusions can **be drawn on the** basis of **the survey observations.** What **the survey does is to provide**

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a foundation oft the basis of which further studies can be initiated. Simultaneously, efforts can be started for the control and treatment of those diseases in which in* creases are seen.

As the survey showed, the incidence of diseases is greater in the proximate area. A deeper study of congenital deformities, skin diseases and solid tumours could be extremely useful. For such a study it is essential that the doctor be in constant touch with the- community. Cause-effect relationships can be established only when field experiences are examined in the spirit of research.

New conditions of existence are causing various kinds of effects. There have been changes galore in psychology, living conditions, food habits, types of work, standards of what is considered good or bad, status symbols, etc. As a result of these changes, the extent of diseases have been increasing and the disease pattern has been changing. We have not found any correlation between the the availability of health services and a decrease in ill-health. Today's health care system is commercial. Patients too equate more expensive treatment, immediate relief, absence of restraints on diet, with better treatment, This means far too many variables and makes the task of analysis all the more difficult. The effort at analysis can be put in but only if the sufferers cooperate.

A great deal of glitter is associated with large projects. People want to be associated with 'new' schemes. They try to maximise their 'profits'. The spirit of sacrifice for larger benefit of the society is lacking. We too live in an area which is affected by a host of large projects. Every day new health problems occur. Change is taking place so fast that there is no time for reflection and analysis.

Or Rogini Piem
Banvasi Seva Ashiom
Govindput Dist Sonbhadra U P

I do not wish to continue my subscription for *Anumukti* henceforth. I can understand the safeguards against nuclear follies. But to accept absolutely non-nuclear India appears to be a very retrograde step. The whole Narmada Bachao movement has revealed to me the most nauseating aspect of the parochial anti-Gujarat, movement of the so-called objective people. Sharad Pawar said the other day, "if any body stops me from building dams on Krishna river I will not tolerate it." Pray, why single out Gujarat? We want to preserve tribal music and poetry but not their hellish lifestyle.

Meghnod Shalt
3 Sahokui
Jelly Gully Andher Bomboy

The Rawatbhata special issue (April/May 1993) was done very well indeed! As 1 am a fairly new member, may I suggest that you enclose a rough map of all Nuclear installations in India with a short not on each. When each was installed and how they are running and how much/little they benefit those that they were supposed to benefit and the destruction they have caused to the environment. This will give one a bird's eye view and be the basis for our strong protests against them. I trust I am not asking for the impossible, but 1 would like to have something concise to show people who, through facts and figures, understand the irreversible damage these nuclear installations are creating.

Pareen lakako
Avasa House. Darbash one
Bombay

Abolish The IAEA

Anumukti strongly endorses the stand taken by War & Peace Digest and** Anti-Atom-International regarding the* ***IAEA and we urge our readers to send letters to politicians asking** for reform* ***in the** structure and functioning of* ***this United Nations' agency

Of all the anachronisms still abroad in the world few have such dangerous consequences as the International Atomic Energy Agency (IAEA).

Following the trauma of the bombing of Hiroshima and Nagasaki, the **nuclear establishment sought to redeem the atom by promising a cornucopia of civilian benefits in medicine, food preservation and "energy too cheap to meter." This** was **the "Atoms for Peace" program. And of course, the nuclear industry urged the development of bigger and letter" bombs to make the world safe from** war.

It was **in the spirit of such gung-ho nuclear enthusiasm that the In**ternational Atomic **Energy Agency (IAEA)** was **founded in 1967, enjoying a 'special relationship' with the United Nations, and committed to the active promotion of nuclear power in all its forms. It was the only U.N. organization committed to the promotion of a particular energy system. Its annual $186-million budget is derived from 112 supporting governments.**

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APPEAL FROM AUSTRIA

W ıp-
s for
a reform of the
IAEA as described below:

Since 1957, when the IAEA was established, the world and its view of nuclear energy has changed. It is time for a change of the IAEA's function, too. The IAEA should become a purely nuclear control organization without any promotional function.

Nuclear power cannot solve world's energy problems. Therefore a "United Nations Agency" for the promotion of nuclear power is obsolete and counterproductive. In this sense, the articles 2 and 3 of the IAEA's statute have to be changed.

The use of nuclear energy for peaceful purposes and the development of atomic bombs are inseparable. The spread of peaceful nuclear technology led to the proliferation of atomic weapons technology.

The NPT was an attempt to stop this development, but it failed because of the limitations in the safeguards regime. In 1995, the parties of the NPT have to decide whether to extend the NPT or not. we think the NPT should be extended - but not without changes.

The NPT should become an effective instrument of nuclear disarmament and non-proliferation:

Establishing of the IAEA as an organization for the effective and comprehensive . control of fissile material—both civilian and military—and extension of its related possibilities and competen-

The application of safeguards to all states without discrimination.

D rticle 4
NPT.
(Promotion of atomic energy for peaceful applications and promotion of peaceful nuclear explosions.)

A complete nuclear test ban treaty.

Stop all civilian and military production of plutonium.

The IAEA's "technical assistance" and "technical co-operation" are promotion programmes for the application of radioisotopes and radiation for industrial, medical, agricultural and other purposes in developing countries. One main reason for this policy has been and still is to give a positive image to a technology which from the very beginning has been connected with death and devastation.

Most of the IAEA's promotion has been given to large-scale projects (e.g. food irradiation). These projects are fequently not adapted to the specific needs of developing countries.

To avoid unnecessary applications of nuclear technology in industry, agriculture and medicine, the United Nations should promote the research on, and the development and application of non-nuclear alternatives.

No further nuclear application in industry, agriculture and medicine without proof of requirements and without proof of non-nuclear options!

No application of nuclear technology withoutepropriate regulations for radiation protection and waste management!

Nuclear power is a hazard to environment and people. Therefore it has to be stopped as soon as possible. Until this aim is reached the IAEA should:

Improve the safety of existing nuclear power plants and other facilities of the fuel cycle!

mprove ___
protection _ I
_________ workers,environment and the public!

Develop solutions for the problems nuclear industry has created: especially for the radioactive waste!

Minimize and avoid transports of nuclear material and waste!

To accelerate the phasing out of nuclear power production the United Nations should:

promote the research on, and the development and application of renewable energies, especially in small-scale installations.

take suitable action to cut down the waste of energy, especially in the industrialized countries.

The IAEA's work has to become more transparent:

NGOs have to be allowed to participate in conferences and in the LAEA's missions. Full information has to be provided for the affected people. To finance this work of NGOs an appropriate part of the countries' contribution to the IAEA budget has to be used.

Now, despite the overwhelming evidence of millions of premature deaths from massive global con tamination by nuclear radiation, despite the continuing deaths and illnesses from the accidents at Three Mile Island and Chernobyl, despite the still-unsolved problems of disposing of vast and rapidly accumulating nuclear wastes that will remain lethal for thousands of years, despite all this, the IAEA continues to act as a propaganda and promotion agency for the nuclear industry.

We suggest abolition of the IAEA The work of rigorously monitoring the nuclear fuel cycle—from the mining of uranium to the dismantling and disposal of nuclear weapons and nuclear reactors—could be transferred to an independent United Nations scientific authority with no attachment to the nuclear industry. And the urgent task of developing alternative, non-nuclear, non-polluting, safe and renewable energy sources should be undertaken by a completely new international U.N.

cy (IAEA) is located in Vienna. Arguing with IAEA's policy of promotion of nuclear technology is an important part of AAI's work.

Anti - Atom - International has recently published a study which documents the role played by the International Atomic Energy Agencyf which is a UN agency, in spreading the ha sards connected with the use of nicelar energy throughout the world. They consider reform of the agency a priority for antinuclear and environmental groups. They feel that efforts to reform organisations such as IAEA can only be successfill if political pressure is brought upon the organisation from many people and many countries. It is in this connection that they have issued the following appeal. They want that as a first step, people should write to their own governments.

Anti Atom International
A-1010 Vienna Austria

Protest In Taiwan

Pol lowing weeks of intense and occasionally violent debate the Legisrcided on July 9 not to review or freeze last year's initial budget for construction of Taiwan's fourth nuclear plant. The decision will allow the construction bidding process to continue. The Taiwan Power Company (Taipower) is to select the construction contractor by the end of this year.

The July 9 open-ballot vote was the second vote in three weeks of bitterly divided and often chaotic debate both in and outside the legislature. The issue was initially debated and voted upon on June 23 by the Legislature's Budget, Economic, Interior Affairs and National Defense Committees. The legitimacy of that vote, which was held in an uproar after hundreds of protesters stormed into the Legislature's meeting hall, was disputed vehemently by legislators of the opposition Democratic Progressive Party (DPP). The opposition forced the ruling party to submit the issue to an open ballot of the full legislature on July 9. The final tally in the voting was 76 to 57 opposed to reviewing last years passage of the budget. In other words, the budget will stand and the project will continue for at least one more year.

Demonstrators from anti-nuclear groups and the Yen Liao area where the nuclear plant is to be built had been camped outside the legislature building in downtown Taipei in protest since early June. By June 23, their numbers had swelled to over a thousand During the afternoon discussions, the Yen Liao protesters stormed through police barricades and broke down the doors of the Legislature Building to get into the meeting hall Chaos ensued in the packed hall and continued during the voting. A scuffle between two legislators over the voting process ended with both in the hospital. When the legislature reconvened two days later, supporters of the two inyured lawmakers clashed outside the hall as legislators inside argued the validity of the previous meeting's vote count and committee process.

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The outcome of the votes reflects the control the ruling party (the Kuomirtfang, or KMT) still maintains over the legislative process. As the decision approached, the KMT leadership devoted their full efforts to supporting Taipower'e plan to build the no. 4 plant. On July 7, President Lee Teng-hui, who also is chairman of the KMT, warned that any KMT legislator who voted in opposition to the fourth nuclear plant would be punished by the party. (Even so, three KMT legislators voted against the project.)

The debate which was raging in the media and society on the need and consequences of building a fourth nuclear plant was rendered irrelevant by the KMT's pressuring of its legislators. The public debate was turned into a purely political issue in which the majority party held control, and the public's doubts about nuclear power had no impact on the decision.

The focus of anti-nuclear groups turns toward next year, when the budget will again be up for review. If there is no visible improvement in Taipower's safety management, opposition to the fourth nuclear plant project is likely to grow even stronger. Many observers are predicting annual clashes over the budget as long as the project exists. If a contract is signed with a bidder this year, however, blocking the project may be more difficult in the future.

On the positive side, the debate over nuclear power escalated to a level never before seen in Taiwan. Opposition to building another nuclear plant has grown in force with every scram and accident at the nuclear plants. The media's standpoint has been increasingly skeptical of nuclear power. And had the KMT not exerted strong pressure on its legislators, the opposition would likely have succeeded in freezing the project's budget. There is hope!

The media in Taiwan, responding to the unceasing string of incidents at the nuclear plants, began reporting on nuclear issues with greater frankness and skepticism than ever before. In the legislature itself, the opposition parties formed a solid bloc to force freezing of the budget, and a few legislators of the ruling Kuomintang (KMT) party even dared to risk the wrath of their party by not supporting the fourth nuclear plant project.

Nuclear Report from Taiwan
July/August 1993

STAR WARS: 1983-1993

A $30 BILLION LESSON

The tragedy was that the Czar could lift a finger, touch a bell and ignite a war without consulting any living person.

Alexander Kinglake 1896 - War in the Crimea

O ne night in 1983, without warning, thout cabinet approval, without a word to the United States Congress or the United Nations, without consultation with the world science community, without notification of any other nation, without even informing the Pentagon or the military chiefs of staff, and without the slightest reflection on the implications, Ronald Reagan off-handedly announced that he wanted to put nuclear bombs in space.

Thus was born Star Wars. SDI Reagan called it. Strategic Defense Initiative. "Some Dumb Idea" commented Admiral Gene LeRoque of the invaluable Center for Defense Information. Former Defense Secretary, Harold Brown said it was "the most irresponsible act by any president this century".

Here was a proposal that would be horrendously expensive, destabilize all existing military understandings, violate the ABM Treaty, initiate a nuclear arms race in space, jeopardize the entire international civilian space enterprise, create a system that could be destroyed by cheap and easy countermeasures, and, even in the unlikely possibility that it could ever be even marginally effective, would, to that extent, simply en* courage adversaries to take the bombs off the rockets and smuggle them into potential target nations. Carl Sagan wryly suggested bombs might be hidden in "all those bales of maryuana that seeto to have no trouble getting past customs." From the beginning the whole idea was impossible, inane, ineffective and counterproductive.

Nevertheless, despite relentless criticism from some of the nation's leading science minds, despite untiring efforts by the Union of Concerned Scientists, and citizen's activist organizations like 1SCOS (Institute for Security and Cooperation in Outer Space), Star Wars would, in the next ten years, soak up $30 billion of taxpayers money to produce nothing but a destructively costly embarrassment. It has now finally been ended by President Clinton.

There are painful and difficult lessons to be learned from the Star Wars blunder — and there is much blame to be shared by many.

Reagan, of course, started the madness when this most intellectually defenseless of presidents was effortlessly bamboozled at dinner one night by that slyest of corrupt scientists, Edward Teller, who went on to profit handsomely from Star Wars contracts and to siphon off billions of tax dollars for his Lawrence Livermore Radiation Laboratories to play with.

But how was Reagan allowed to proceed so far so fast with so preposterous a scheme?

Thousands of scientists who should have known better—indeed, who did know better—nevertheless dived into the apparently bottomless trough of public funds for all manner of crazed schemes—orbiting X-ray Lasers powered by nuclear bombs!—things they knew could not and would not work, but could eat up literally trillions of dollars in pointless research. Despite the heroic efforts of a minority to halt the project, many scientists and the science community as a whole have lost much respect by this disgraceful display of greed and dishonesty.

The fact that, year after year, with virtually no discussion, Congress meekly caved in and voted for huge allocations for Star Wars reflects ill on the collective level of intelligence, judgment and integrity of the members of both houses. Including alas, then Senator Al Gore, who unfailingly supported the scheme.

The mainstream media has largely let the outrage of Star Wars slip by with the same sort of lazy, indifferent and shallow reporting they displayed in the other Reagan-Bush scandals.

But sadly, people probably do get the government they deserve. The fact is there was virtually no spontaneous or organized public outcry. It is an unflattering reflection of American citizens. There seems to be truth in the observation by Robert Hughes in his current bestseller, *Culture of Complaint*, that "Reagan educated America down to his level. He left his country a little stupider in 1988 than it had been in 1980."

So what are the lessons?

It seems that there is need for some corrective legislation. It makes no sense that so vast a change in the military policy and weaponry of the world's most powerful nation can be determined by a mere passing whim of a notoriously ignorant and ill informed president. Nor has the threat ended. There is no guarantee that, next year or next century, some unforeseen exigencies of economics, politics or society will not again throw up another president like Reagan.

Work therefore should begin immediately on devising some more orderly legislative procedures by which monumental undertakings like Star Wars can first be held up to public scrutiny and debate—in the USA and in the United Nations—before such dangerous and extravagant fantasies are set in motion to so willfully and pointlessly plunder the public purse again.

But at least, for now, the slow death of Star Wars has begun; thus, as ISOOS President Carol Rosin, has pointed out, depriving the generals of their last, desperate justification to resume nuclear testing.

Letter from Kakrapar

Of all the nuclear power plants in the world, for us in South Gujarat, Kakrapar is the one that gives us the most nightmares. Its proximity overwhelms everything else.

It is not that the plant is very old and suffering from all the various kinds of problems like neutron induced brittleness and bacterial corrosion that beset old reactors like the one at Tarapur. In fact, the reactor at Kakrapar is brand new. It has yet to celebrate its first birthday. Yet on July 31st it had an unplanned shutdown. Another Rs. 50 million down the drain. Or is it Rs. 100 million? Who knows and who cares!

Just a month ago, the Atomic Energy Regulatory Board (AERB) had announced with much fanfare that following the report of the inquiry committee investigating the cause of the devastating fire at Norora Atomic Power Station on March 31, 1993, all the nuclear power plants in the country were to be closed down for inspection.

Quite a few newspapers wrote editorials congratulating the AERB for having come of age and having grown (at long last) a set of teeth. Alas, AERB has been toothless for so long that it hah now no idea what teeth are meant for. One would have expected that this sudden unplanned shutdown at Kakrapar would be a fine opportunity for AERB to thoroughly inspect the reactor. Such an inspection is all the more necessary since in the first place the AERB allowed the reactor to start without properly checking if vital safety systems like the Emergency Core Cooling System were functioning as per design intent. But no inspection was undertaken and the reactor was restarted on 6th of August to commemorate Hiroshima Day.

You wouldn't think of it but Hiroshima Day is something 'special' at Kakrapar. On 6th of August in 1086 police fired on a large rally of protesters killing one young boy and injuring another. Ever since, every Hiroshima Day we witness a huge contingent of police drawn from various districts of Gujarat patrolling the villages. Of course, most people prefer to remain indoors, in order to avoid any sort of provocation. Although for the last five years there has been not even a hint of protest, the police have stuck to their vigil. The beginning of June brings monsoon showers and the beginning of August brings police interrogators.

At the time construction of Kakrapar project began some were happy that this project would 'improve' their employment prospects. However, after working for a little while in the plant complex many are beginning to have doubts. There have been persistent reports of mysterious disappearances. One worker in the operations and maintenance section who was working on elevator number 112, became unconscious. There was a rumor that he received 3,000 millirem of radiation dose in half an hour. People tried to revive him, but they seemed afraid to touch him. Finally he was sent to Bombay. Three months have passed and there is still no news of him.

Coming back to the unplanned shutdown of July 31. The authorities told a correspondent from *Sandeah* (a Gujarati newspaper) that the shutdown had been due to large vibrations in the turbine blades. The bearings had worn out and had become loose they claimed. These had been replaced by a new packing and now all was hunky-dory. Though it is beyond understanding how bearings could have worn out in less than a year.

Some have definitely benefited from Kakrapar at least in monetary terms. The Mandvi Education Society, which runs the Mandvi High School is one such. On 27th of August they received a 'donation' of Rs 200,000. Last year they had .received a donation of Rs 500,000. No doubt there will be more donations to worthy causes in the future as well. **Some** uncharitable antinukes have dubbed these donations as 'blood money'. They claim that Mandvi High School which is within 5 km of the atomic power station is jeopardizing the future health of its students.

Some other schools have decided to play it safe. The school **at** Vanskui run by the Gram Seva Samaj an organization associated **with** Shri Jhinabhai **Darji** **has already shifted premises and** relocated outside **the** 5 km **zone.** They deserve congratulations for their sense of responsibility towards their students. Other schools are also considering shifting to newer distant sites. They ought to be helped by the government in this eminently sensible move. Similarly the government should help other residents in the vicinity of Kakrapar to relocate.

Surendra Gadekar

Subscription Information

Rs. 30/- per year (6 issues) South Asia
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 600/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0631) For cheques and drafts drawn on other banks, please -add Rs6/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, 394 641 India

Please do not send personal checques or drafts addressed to Surendra Gadekar

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Published by Surendra Gadekar for Sampoorna Kranti Vidyalaya and printed at The Parijat Printery.
Ahmedabad

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 7 Number 2 **October/November 1003**

Awards

The beginning of the year is usually considered to be a fit time for announcing of awards commemorating significant actions during the past year. For once, *Anumukti* joins the bandwagon.

National Gratitude Award for the most significant action by members of the nuclear community:

- *Shift operators at Narora Nuclear Power Plant*

On the night of 31st March, 1993, it was their quick thinking and decisive action in utilising the fire engines which had come to put out the raging fire at the turbine room of the plant to instead drive the secondary pumps and cool the reactor, that avoided a major nuclear catastrophe in one of the most densely populated regions of the country.

Nucleocrat of the Year Award for the best action by an official of the nuclear establishment:

- *Or A Gopalakrishnan (Chairman, Atomic Energy Regulatory Board)*

for his initiative in trying to impose some form of control and regulation over the proliferating X-ray clinics all over the country This is a long overdue action and *Anumukti* can only applaud this initiative to reduce excess radiation dose received by the patients, radiographers, doctors, onlookers and the general public, (see story next page) If only Dr Gopalakrishnan can summon the same initiative and curb the excessive radiation emissions from nuclear facilities.

The Nukespeak Award for the most outrageous statement by a nucleocrat:

- *1. DrR Chidambaram (Chairman, Atomic Energy Commission)*

There has been no accident of any kind in nuclear stations in India and no radiation injuries have occurred at any time." (P77Bhubaneshwar 7.9. 1993)

- *2. Dr R Chidambaram*

"We don't dump nuclear waste anywhere. We immobilise it." *(PTI* Bhubaneshwar September 7,1993)

- *3. Dr R Chidambaram*

"No harm will be done even if the radioactive sources remain in water and slush of the Cooum for a thousand years. (The Hindu October 22,1993)

All these statements are breathtakmgty outrageous. They confirm to the 'high' standards of nukespeak set by such illustrious predecessors as Dr Raja Ramanna and Dr P K Iyengar. One can only admire a person who has such a well developed

case of foot in the mouth disease. No other nucleocrat came anywhere near Dr Chidambaram's exalted level on the nukespeak scale.

Never Too Late For Realism Award:

- *1. Dr R Chidambaram*

"The spent nuclear fuel lying at Tarapur can cause radiation hazards. Indefinite storage is certainly a problem". *(The Telegraph: 20.12/93)*

- *2. Mr D. V. Gopinath Director of health, safety and environment group at Bhabha Atomic Research Centre*

"Emergency situations beyond the design basis of nuclear power plants cannot be ruled out. There is need for implementing a comprehensive preparedness plan." *(Times of India 11.9.1993)*

From the Editor's Desk

Every year, come October November, I start getting a bit nervous. This is Diwali time and the time when my printer takes a long holiday. Besides, during Diwali there is a very heavy rush for printing jobs. Almost every year for the last five years the October/November issue gets delayed and that makes for a backlog which takes a long time and effort to clear.

But this year, I was sitting pretty. Most of the work had already been done and there were just one or two little things that I wanted to change. Diwali was still a while away and I felt sure that now with modem technology like fast computers and all available at Vedchhi, this was the year that Anumukti finally would start sticking to schedule.

And then there was literally a bolt from the blue. As I was giving the final touches, a surge of lightening struck near the house and the computer took off into orbit. Recovery was painfully slow and when finally the hardware was replaced there appeared a virus in the software which took even longer to repair. I learnt a lot about computers and computer viruses, but *Anumukti* remained in the limbo. Today is 5th of February, 1994 and I can only say Happy New Year and wonder whether these modern 'time-saving' gadgets really do save time. Someone rightly said, "Either you work with people or you work with machines. People give trouble and are unreliable but machines are a whole lot worse."

India to initiate X-ray Controls

India's Atomic Energy Regulatory Board (AERB), which produces guidelines on radiation safety, is to review the operating conditions of medical radiography equipment and to update the guidance it issued in 1989. The board has announced a nationwide regulation programme under which all existing radiography units will be registered, reviewed for radiation safety, and subjected to stringent controls. The programme is designed to eliminate what officials from the board say are unsafe practices that could be jeopardising the health of patients as well as staff.

India has about 50,000 medical radiography units, and about 1,500 new machines are set up each year. Radiographic diagnosis is very popular and patients sometimes demand x-ray examination.

The board has evidence that some radiography machines have faulty diaphragms and improperly oriented primary beams. Protective accessories like gonadal shields and lead aprons are not used in many units, according to the board.

"Although radiation safety authorities offer personnel monitoring services, x ray units are unfortunately reluctant to use them", said a senior official from the board. Studies conducted by the board have shown that some patients might be receiving 50—200% excessive exposure.

The board has also expressed concern over poorly trained radiography staff. It says that private institutions with neither adequate equipment nor qualified trainers have cropped up and offer very short courses in radiography. Those trained in such institutions find jobs in many of India's privately owned units and hospitals.

Many doctors share the board's concerns. "In this business there are probably more unqualified people than adequately trained radiographers," said Dr Rajjnder Nath Bagga, secretary of the Indian Radiology and Imaging Association, which represents some 2000 radiologists.

The new initiative will make periodic quality assurance tests of all radiography machines mandatory. The board and the radiologists' association also plan to conduct joint training programmes for staff in radiography units.

Gurunandan, science writer, New Delhi; British Medical Journal 30.10.1993

Hiroshima's shadow over Sellafield

Sellafield is the site where Britain began its quest for the A-Bomb. Today it is the heart of nuclear Britain with large reprocessing plants. The thermal oxide plant (THORP) located there was recently allowed to start operations by the government, although antinuclear groups have vowed to take the matter up in the European Court of Justice. Sellafield or Windscale as it was previously known has become a byword for nuclear contamination. The Irish Sea near Sellafield is the most contaminated sea in the world and there have been many reports of excess childhood leaukaemia cases in the immediate neighbourhood of the plant. In 1990 Or Martin Gardner of the Southampton University, published a paper which showed that the chances of leaukaemia in children were significantly enhanced if their fathers had worked in the plant and had received radiation (well within the 'acceptable' limits) during a period six months prior to conception. (See Anumukti Vol.3 No.3) Recently, a case was brought against British Nuclear Fuels (BNFL) the owners of the plant by two of the victims. This is the first of three articles which outline the major arguments on both sides, the variety of health problems encountered in the area and the difficulties in taking a major industry like nuclear power to court.

A 11 pm on 8 October, the final curtain came down on Hope and Reay vs British Nuclear Fuels, so ending one of the longest suits in the history of British civil law. The "Sellafield cancers case", as it was dubbed by the nation's headline writers, had all the makings of classic legal drama-allegations about radioactivity and genetic damage, families of children with cancer seeking compensation, a large and powerful industry in the dock. The case also threatened to break new legal ground. For the first time a British court was being asked to rule on personal injury claims based on alleged genetic damage from radiation. Victory would throw the doors wide open for other Sellafield familes to sue.

At issue was whether the cancers suffered by Vivien Hope and Dorothy Reay—the daughters of lifelong employees of British Nuclear Fuels (BNFL)—could be blamed on radiation damage to their father's sperm at BNFL's nuclear reprocessing plant at Sellafield. But as the hearing unfolded it soon became clear that Sellafield's safety was not the only thing on trial. Also in the dock was the competence of science, specifically its ability to judge the risks of radiation to reproductive cells. Could exposure to relatively low doses cause genetic defects to be passed on to children through damaged sperm?

Expert witnesses flew in from across the globe and for 90 days scientists and lawyers grappled with a mass of semingly conflicting findings. Half this time was devoted to discussing epidemiological research into the possible links between radiation exposure to adults and cancers in their children. And in this crucial part of the hearing the court examined some 15 different studies. Finally, the debate about these studies boiled down to a duel between two opposing pieces of research.

The plaintiffs' hopes were pinned largely on a controversial British study by the late Martin Gardner, professor of medical statistics at the University of Southampton. Three years ago, Gardner claimed to have found a statistical link between the incidence of leukaemia and non-Hodgkin's lymphoma in children born to men employed at Sellafield and the amount of radiation the men had been exposed to before their children had been concieved. Pitted against his research in court were results from the largest and most influential of all studies of the genetic effects of radiation—the huge follow-up study of survivors of the atomic bomb blasts in Hiroshima and Nagasaki in 1945. This study, as BNFL's lawyers eagerly pointed out, found no excess of cancers of genetic defects in the children of survivors who had been exposed to radiation.

When the hearing ended, the ruling ran to more than 200 pages. Yet the essence of the judgment was simple enough: in the debate about epidemiology, the negative findings from the atomic bomb study were deemed more convincing than Gardner's positive findings BNFL cleared, was the tone of most newspaper headlines. **But despite this result, the** courtroom **debate had** succeeded in exposing **potential complications with the atomic bomb research which have never before** been aired in public.

Atomic Bomb Survivor Studies

The genetic studies on the children of atomic bomb survivors began in the spring of **1948, and were led for many years by Jim Neel and Jack Schull Neel. now at the University of Michigan Medical School, Ann Arbor, became acting director of field studies for the Atomic Bomb Casualty Commission in Hiroshima in 1947. Two years**

later he was joined by Schull, now at the University of Texas. The Radiation Effects Research Foundation (RERF) succeeded the ABCC at Hiroshima.

From the outset of the case, the results from the ABCC and RERF posed a major stumbling block to the Hope and Reay families. In more than forty years of research, Neel, Schull and their colleagues have failed to uncover any convincing evidence of an excess of harmful genetic mutations in children whose parents had been exposed to atomic bombs. This is despite the fact that they have looked at as many as 75,000 such children, and that the average exposure to radiation at Hiroshima and Nagasaki was higher than that for Sellafield workers.

Gardner's Results

The contrast with Gardner's results couldn't be greater. In 1990, he and his colleagues published a paper in the British Medical Journal claiming that children born to Sellafield workers who had previously been exposed to a cumulative dose of more than 100 millisieverts of radiation—twice the maximum annual dose at present allowed under British law- were eight times more likely than other children to develop leukaemia or non-Hodgkin's lymphoma.

Gardner believed that the discrepancy between his study and the Japanese data could best be explained either by differences in radiation dose rates—a sharp blast in the case of the atomic bombs versus chronic exposure to low levels at Sellafield—or else by differences in the average intervals between expoure and conception. Both these points were important to the plaintiffs' case. But, in addition, the plaintiffs' lawyers tried to expose weaknesses in the ABCC and RERF study.

Bizarre paradox

Part of their approach was to focus on what seems to be a bizarre paradox in the Japanese data: namely, that children born to atomic bomb survivors appear from these data to be healthier than children of the same age born in Japan as a whole. And not by a trivial margin either. Stillbirths were down 85 per cent, deaths from cancer by 20 per cent, overall mortality by 30 per cent and infant mortality (from all causes) by 35 per cent. So counterintuitive are these findings, argued Eva Alberman, a reproductive epidemiologist at St Bartholomew's Hospital in London and a key witness for the plaintiffs, that they can mean only one thing: the researchers must have inadvertently failed to identify all the deaths and genetic deformities in children of survivors who had been exposed to radiation. It was either that, or the bombs had conferred some beneficial effect—which "seems crazy". This was robustly denied in court by Neel and Schull, who said the beneficial effect was either statistically insignificant or the product of terminology differences.

The most likely explanation for the apparantly crazy finding in the ABCC study:—The children born to atomic bomb survivors appear from the studies to be healthier, than those born in the rest of Japan— is that the study failed to diagnose all cases of congenital problems.

Testifying in court, Alberman highlighted two apparent inconsistencies in the Japanese data. First, she said, the reported incidence of Down's syndrome among children born to survivors was half what would be expected on the basis of statistics from other countries; and secondly, Down's syndrome was twice as prevalent in the children of suvivors classified as "not exposed" as it was in children of "exposed" survivors. Neel and Schull's explanation is that, on statistical grounds, the rates are too unreliable to compare in that way. But Alberman believes the most likely explanation is that the ABCC study failed to diagnose all cases of Down's syndrome. And if that is so, she says, perhaps other congenital conditions had been underdiagnosed. According to the ABCC's figures, about 1 in 100 babies conceived by atomic bomb survivors between 1948 and 1954 were diagnosed as having a major congenital deformity such as hydrocephalus, spina bifida and polydactyl. The comparable figure for Britain in 1958 was 1.7 in 100.

In the early years after the bombs, Alberman told the court, most Japanese women gave birth at home, attended by midwives who were not trained in diagnosing deformities. Another potential problem might have been deliberate underreporting. Neel's opinion about this seems to have shifted with time. In court he said: "It rapidly became known throughout Hiroshima and Nagasaki that malformation was a possible outcome of exposure to the bomb. This did much to remove the stigma because then you had a causal agent inflicted upon the women. It was a cause she could accept." But in 1958 Neel wrote: "The birth of a malformed child stigmatises the family involved to a greater extent in Japan than in most Western cultures, and it seemed quite possible that the physician-interviewer had not established sufficient rapport with the family to obtain an accurate history. So could the Japanese data have under-, estimated the medical problems suffered by the children of suvivors exposed to radiation? Testifying on behalf of BNFL, Neel and Schull accepted in court that the studies had been difficult to carry out. But they were adamant that their estimates of the genetic risks of radiation exposure were accurate. The main reason for their confidence was that these estimates are based on a comparison of similar groups of children—those bom to people who had been exposed to radiation from the bombs, and those born to people living in or near Nagasaki and Hiroshima who had been exposed to little or no radiation.

The reported rates of stillbirths, congenital deformities, infant mortalities and deaths from cancer are almost identical in these groups of children. And it is this comparison that matters most, say Neel and Schull. Even if the children of atomic bomb survivors seem to have been abnormally healthy compared with children living elsewhere (and this claim was denied in court), the fact that parental exposure to radiation seems to have had little effect in the children's health means only one thing in the eyes of the ABCC researchers: that exposure to radiation failed to damage the reproductive cells of the atomic bomb survivors.

To shatter this assertion, the plaintiffs' lawyers had to try to show that the diagnosis of medical problems may have been uneven in the "exposed" and "unexposed" groups. Could American researchers, for example, have overlooked a disproportionate number of luekaemia cases in the children of the "exposed" groups? This was unlikely, said Neel, because any problems would automatically apply equally to all groups of children in the study.

Yet there was one uncertainty which Neel freely acknowledged in court. Early in their study, the ABCC researchers had to abandon their attempts to gather data on miscarriages in the first five months of pregnancy. It became clear, said Neel, that it was impossible to monitor these losses. This meant that the researchers had to make two assumprtions when calculating the genetic risks of radiation: first, that fetuses were lost for the same reason in "exposed mothers" as in "unexposed mothers"; and secondly, that the rate of loss was the same in all groups.

Because these assumptions are unverifiable, Alberman contends that the ABCC results cannot be used to assess accurately the inheritable risks of radiation exposure. A high proportion of spontaneous abortions in the first few months of pregnancy are thought to result from genetic mutations that affect fetal development, she told the court. And there are at least some grounds for thinking that such mutations might have been more prevalent in the reproductive cells of survivors exposed to high doses of radiation. If Alberman's concerns are justified, then the ABCC's estimates of genetic risk are based on data gathered after the period during which most of the lethal damage from radiation would have been eliminated.

Rocketing Abortions

Another potential source of bias between the "exposed" and "unexposed" groups emerged in court: abortions. All over Japan the abortion rate rocketed after the war. With thousands of people returning from Japan's former colonies, the government decided to make abortion freely available as a form of birth control. One consequence of this policy was that as many pregnancies were deliberately terminated in Hiroshima in 1950 as came to term.

What if a disproportionate number of these abrotions were of fetuses with genetic defects, asked the plaintiffs' lawyers. Might not the high abortion rate then mask some of the harmful effects of radiation? This was unlikely, said Neel. The high abortion rate could only have biased the results if some women chose abortions because they knew they had been exposed and as a result suspected they might be carrying damaged fetuses. Certainly, Schull told the court, there was a great fear among exposed survivors that radiation might cause congenital deformities in children. But there was no evidence that any women survivors had decided to have an abortion for these reasons, he said. Rather, the most commonly acknowledged reason for abortion was poor economic circumstances, according to a study of a small sample of survivors by Schull. But in court Alberman wanted to know why data from Hiroshima showed an increasing trend in abortion with increasing radiation dose.

It is dear from the ruling that the debate about miscarriages and abortions failed to convince the judge that diagnosis of medical problems in the "exposed" and "unexposed" groups of survivors could have been seriously biased. But this still leaves a paradox unexplained: why did the children bom in both groups appear to be healthier than those born elsewhere in Japan or in other countries? Why were the rates of infant mortality, stillbirths and cancers seen in the children of survivors so low?

According to the ABCC study, death rates from cancers in children of "exposed" and "unexposed" survivors were 20 per cent lower than in people of the same age in the rest of Japan. The researchers' explanation of this is that cancer rates are rarely uniform within a country and it therfore makes no sense to compare results gathered in specific towns and cities with national averages. But cancer epidemiologist Scott Davis and biostatistician Ken Kopecky, who have both worked at RERF, told the court that it was reasonable to presume that the ABCC study had missed some cases of leukaemia, particularly in the early years of follow up when conditions were difficult, and that this may have contributed to the low cancer rate. Schull conceded that just ten misdiagnosed leukaemia cases among children of "exposed" survivors could have obscured a link between the cancers and inherited effects of radiation exposure. One potential source of error highlighted in court was the risk of misdiagnosing leukaemia as respiratory disease: children with leukaemia are 300 times more vulnerable to pneumonia.

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The frequency of stillbirths among atomic bomb survivors was recorded to be six times lower than the number of stillbirths recorded by the Japanese government for the districts of Hiroshima and Nagasaki as a whole, and which included individuals who were too far away from the nuclear explosions to be irradiated. Neel argues that this gap reflects differences in the definitions of stillbirth used by the ABCC and the Japanese government. The government figures are relatively high, he maintains, becuase unlike those from the ABCC they include babies who lived for a few hours and then died — cases which the ABCC counted as infant deaths and some deliberate abortions. The ABCC figures, on the other hand, are relatively low because they exclude miscarriages before the fifth month of pregnancy (the Japapnese government's miscarriage records start from the third month) and stillborn babies with major malformations.

But such differences cannot be the whole story, argue critcs, who raise three problems. First, since the ABCC was counting as "infant deaths" cases which the goverment termed "stillbirths", one might expect the ABCC's infant mortality figures to be higher than those collected by the Japanese goverment for Japan as a whole. In fact, the opposite is true. Secondly, the government stillbirth rates for Hiroshima and Nagasaki were based on medical data for the surrounding rural areas as well as for the cities them selves. (Unlike the ABCC figures, which were largely confined to the cities.) This makes the real gap between the ABCC and government data even greater, for the official stillbirth rate for cities in Japan was almost twice the rate for rural areas, according to 1950 figures.

Finally, even without adjusting for urban-rural differences, it is hard to make the government and ABCC figures tally. Adjusting the ABCC figures so as to include babies stillborn between three and five months gestation and those with major malformations would increase the ABCC figures by about 65 %, while adjusting the government figures so as to exclude deliberate abortions would produce a 10 % reduction in the official stillbirth rate. The government and ABCC figures would still differ by at least a factor of three. Alberman's conclusion about the ABCC stillbirth figures: they fail to include babies that should have been registered but possibly died before registration.

Infant mortality rates for children of "exposed" and "unexposed" survivors were 35% lower than in Japan as a whole. In the 1940s and 1950s most infant deaths in Japan were caused by infectious diseases like T.B., Cholera and Pneumonia, which exacted their biggest toll on poor, badly housed families with little access to health care. Neel told the court that the most likely explanation for the low infant mortality figures was "that living conditions were difficult in Hiroshima and Nagasaki prefectures, but they were more difficult elsewhere." If that is true, than things must have been very bad indeed elsewhere. Neel and Schull agreed in court that there was a shortage of trained medical staff and diagnostic equipment in Hiroshima and Nagasaki in the first few years after the bombs, and in a 1990 paper they state: "It is not unreasonable to assume that the aftermath of the bombing worsened the socio-economic status of many survivors." As late as 1968 the Japanese government felt the need to pass a special kaw "to extend welfare, by providing special allowances, to A-bomb survivars who suffered injuries and even now experience special hardships."

Until the recent High Court case, the unusually low rates of stillbirths, mortality, congenital malformations and cancer reported for the children of atom bomb survivors had barely been debated by scientists. Why? One reason is the authority the ABCC study has'acquired as a yardstick for asessing the risks of direct exposure to radiation on nonreproductive (somatic) cells. Many governments frame their rules on occupational exposure on the basis of the Japanese data. If there is nothing wrong with the data gathered from people who were diirectly exposed, ask most scientists, why should there be anything wrong with the data gathered for survivors' offspring?

But the acceptance of the somatic studies has not been universal. For three decades, Alice Stewart, an epidemiologist from the University of Birmingham, has argued that the data underestimate the risk of cancer developing in children exposed to radiation while still in the womb. Stewart discovered that children who had been exposed to X-rays in the womb were 60 per cent more likely than average to develop cancer. In contrast, the follow-up study of Japanese children who had been exposed to radiation while in the womb found no increased risk. Many scientists belittled Stewart's findings for several years, until other epidemiological studies began to confirm them.

Commenting on the discrepancy between the Japanese studies of womb exposure and data from Western populations, Nick Day, director of the Medical Research Council's Biostatistics Unit, said in court: "Instead of two childhood cancer cases (linked to womb exposure) observed in the survivors, you would expect 11.45. So between 11.45 and 2 there is clearly quite a divergence. The results on womb exposure show most dramatically how the studies on atomic bomb survivors have been allowed to take precedence over other studies that have produced conflicting results. Now that Stewart's results have been confirmed, the RERF researchers are claiming that their study is consistent with hers. Is the same likely to happen with the paper by Gardner? Time will tell.

Sara Downs

Retinoblastoma and Low Level Radiation

Twenty times more common in children whose mothers have lived in Seascale

The village of Seascaie, near the Sellafield nuclear reprocessing plant, is best known in epidemiological circles for its longstanding high incidence of malignant disease in young people, which has recently been confirmed as having persisted during 1984-90. Throughout, the excess has been largely accounted for by leukaemia and non-Hodgkin's lymphoma. No cases of retinoblastoma have been found in Seascaie, but at least five cases have occurred in children whose mothers had lived there at some time during 1950 onwards. The maternal grandfathers of three of these children had worked at Sellafield. Three further cases have occurred among children born in Copeland, the county district that contains both Seascale and Sellafield, but whose mothers had never lived in Seascale; the father of one and the paternal grandfather of another had worked at Sellafield.

Controversy continues over the possible causes of the excess of leukaemia and lymphoma in Seascaie. Gardner and colleagues concluded that the excess was restricted to children of mothers who were resident in Seascale at the time of the birth, but Kinlen has recently shown that a similar excess exists among young people in Seascaie who were born elsewhere. In **their** case-control study of young people in West Cumbria diagnosed during 1950-85 Gardner et al found **that the** excess occurred among children **whose fathers** had been exposed to high levels of radiation before **the** child was conceived and suggested **that some cases may have resulted from paternal germ cell mutation. This does not, however, account for the excess among those born outside Seascale.**

Epidemiological evaluation of the apparent association of retinoblastoma with Seascaie is, if anything, even more difficult. Retinoblastoma occurs in two forms. Hereditary retinoblastoma is nearly always bilateral (both eyes) and occurs in families in which there has been a germ cell mutation. About two thirds of hereditary cases arise from new and one third from old germ cell mutations. Non hereditary retinoblastoma is caused by two mutations to a somatic cell and is invariably unilateral.

One of the cases linked to Seascaie is known to be hereditary. This was in a girl with no family history of retinoblastoma who developed bilateral tumours; she had a partial deletion of chromosome 13, which was not present constitutionally in either parent and thus represents a new germ cell mutation. It seems likely that most of the remaining, unilateral cases are non-hereditary as probably under one in 10 cases of unilateral retinoblastoma is hereditary. At first sight it is puzzling that no case has been diagnosed among children who were themselves resident in Seascaie. allthough the observed incidence among children of mothers who had previousry lived there has been calculated to be about 20 times expected. Even if the risk was indeed 20 times that in the rest of Britain, only one case of retinoblastoma would be expected in Seascale every 40 years

Virtually nothing is known about the causes of non-hereditary retinoblastoma or of mutations leading to the hereditary form. The cumulative incidence for combined hereditary and non-hereditary forms of the condition ranges from 45-60 cases per million among mainly white populations to about 100 per million in Nigeria and

Uganda; the highest recorded rate, though based on only 11 cases, is 153 per million among Navajo of the south-western United States.

Little international variation exists in rates of bilateral retinoblastoma, with cumulative rates generally of 15 25 cases per million, whereas the incidence of the unilateral, predominantly non hereditary form ranges from 30 40 cases per million in many industrialised nations with temperate climates to about 75 per million in tropical Africa and 125 per million among the Navajo. These data indicate that non hereditary retinoblastoma is more common among populations of low socioeconomic status and in tropical climates.

The only published case-control study of retinoblastoma included 67 sporadic hereditary and 115 non hereditary cases in North America. There was a significantly raised odds ratio for non hereditary tumours among children whose mothers had never attended high school, again pointing towards an association with poor socioeconomic conditions. Seascale, however, has a population of an unusually high socioeconomic status.

Antenatal obstetric irradiation is the only environmental factor certain to cause more that a handful of cases of childhood cancer in Britain By far the largest body of evidence for this is the Oxford survey of childhood cancers, but separate analyses of retinoblastoma in the survey have never been published and, as cases were ascertained from death certificates and survival with retinoblastoma has been very high for at least half a century, it contains very few cases of this tumour. In the American study, for sporadic hereditary cases there was a non-hereditary cases there was a non-signifi-

'cant raised risk with exposure to x-rays during pregnancy. Many Navajo have been engaged in uranium mining, but information on exposure to ionising radiation was apparently not available for the affected Navajo children or their parents. A large study linking the records of the National Registry of Childhood Tumours with those of the National Registry of Radiation Workers is in progress, and this should show whether there is a raised risk of childhood cancer in general, **or** of particular types, in the offspring of radiation workers and, if so, whether the risk is related to the dose of radiation.

The best available method for moving closer to solving this puzzle may be to study DNA from the affected children, as this might distinguish somatic **from germ line mutations. If a mutation could be found in tumour** material this would lead to a search **for** constitutional **mutations in the child** and his **or her parents. If germ line** mutations are found the **type of** mutation might shed light **on** their cause.

C.A Stiller
British Medical Journal: 21.8.1993.

Taking an Industry to Court

The author of this article as well as that of the first article on Sellafield, Sara Downs worked as a researcher for the firm of solicitors for the plaintiffs in the Hope & Reay -Vs-British Nuclear Fuels case. She visited Vedchhi in September and wrote this article. This was before the judgment in the case had been delivered. In India too, we have many cases of personal injury caused to people living in the vicinity of nuclear establishments. This article gives a foretaste of the kinds of problems the victims are likely to encounter in their efforts to obtain justice from the legal system.

This article relates lessons learnt during the preparation of a case recently heard in the British High Court: [Hope & Reay -Vs- British Nuclear Fuels public limited company (BNFL)]. Vivien Hope and Dorothy Reay lived near the Sellafield nuclear reprocessing plant in Cumbria, owned by BNFL. The incidence of leukaemia and non Hodgkin's lymphoma among young people living near the plant between 1950-1991 has been shown to be more than 15 times higher than expected. Vivien had contracted non Hodgkin's lymphoma and Dorothy had contracted leukaemia. Their case was that radioactivity from the Sellafield plant caused or materially contributed to their cancers. Although this was a personal injury claim for damages due to radiation exposure the lessons learnt are relevant to other personal injury claims by members of the public against a large industry in the civil courts.

Considering a Case

One must be convinced that the claimant (the potential Plaintiff) has a **good case. Running this type of cases is expensive and extremely hard work for everyone involved. The industrial company against which the claim is to be made, will undoubtedly have greater resources than those available to the Plaintiff. In general also the scientific community are more likely to be on the side of the industrial company because there are large gaps in our knowledge of the precise effects of industrial pollutants, and scientists are by their nature conservative. Or they may be sympathetic to the Plaintiffs' case but their work might be funded by grants given directly or indirectly by the industrial company to be sued. They will be reluctant to prejudice these.**

A strong case which results in a successful claim may open the door to further claims where the evidence is less compelling. A weak unsuccessful claim is likely to close the door to a later stronger claim even if the evidence is compelling. The Plaintiffs legal costs legal costs may well have be raised through fund raising activities.

If the case is unsuccessful, people will

be reluctant to contribute to further cases.

There is sometimes an argument for delaying a claim until scientific research crucial to the case has **been** completed. In the Sellafield case it would have been risky to have made a claim for damages on the basis of anecdotal evidence that childhood cancers were in excess near the plant. The claim became much stronger once further epidemiological studies of the area had been completed **and** the scientific community accepted that the excess was not a chance phenomenon.

Law

The law and legislation relating to the plant's operation must be thoroughly reviewed.

The plant may have been under the control of more than one company or government body and claims should be made against all of them in the initial writ.; unless **the more recent operators have taken on all liabilities re-**

suiting from the previous operations. In the early stages of the case it may seem clear that only one particular operation or operators are responsible, but one can be certain that one is only aware of a tiny proportion of what will be known by the time the case is heard in court. At that stage it may be apparent that operations by other operators of the plant had their part to play in causing the damages. If their contribution is crucial and they were omitted from the initial writ, the claim will fail.

There may be a number of causes for action and it is essential to be aware of them all so that the one most easy to prove is followed.. In the Sellafield case, conceivably a claim could have been made on the basis of negligence under the common law. However, on reviewing the legislation it became apparent that the Nuclear Installations Act 1971, placed nuclear installations in the UK under a strict liability to compensate for damages. This meant that only causation had to be established by the Plaintiffs and not negligence as well. Negligence is often difficult to prove because it requires showing that the operators reasonably should have been aware of the risks resulting in the damage to the claimant.. In the Sellafield case this could well have doubled the time spent preparing the case and the time spent during the hearing.

The Plaintiffs

From service of the initial writ the Sellafield case has taken four years to prepare and be heard in court. This is short for a case of this complexity and has only been possible by having the equivalent of two solicitors and one and a half researchers work on the case full-time.. There were also four barristers working intermittently on the case during it's preparation and full-time once the court hearing began.

The Plaintiffs must be made aware of the fact that legal proceedings are lengthy and they themselves must be convinced that the claim is important enough to them to it see through to the end of the court hearing. They must be able to ignore criticism of their action. This may be difficult, particularly where the local community is economically dependent on the continued operation of the plant, as in the case of Sellafield. Avery high proportion of the West Cumbrian population work at the Sellafield plant. 90% of the male population in the village closest to the plant (Seascale) , where Vivien lives with her family, work there. Many local people see the families and lawyers making claims as greedy, publicity seeking and guided Only by self interest. Local press is unsympathetic to their cases. One family has had to face pictures of their daughter who has died of leukaemia in the local paper alongside comments that her case is responsible for the hesitation of the British Government to give the go ahead for the operation of a new reprocessing plant (THORPE) on the site In these circumstances it is invaluable to have a local support /pressure group sympathetic to the fa'milies cases. They can disseminate information to counter the pro nuclear lobby in the area and also help contact between families taking similar actions.

Evidence and Experts

The evidence provided to the court will be in the form of testimonies from experts as well as factual evidence from the families and other local people. Proof of causation in the Sellafield cases relied principally on scientific evidence and 90% of the time during the Court hearing was spent listening to examination and cross examination of this evidence. There was evidence from over 20 scientific experts from all over the world and it look over 7 months to hear. Many experts were needed because scientists generally have only a narrow field **of expertise.**

Choice **of** scientific **experts takes** time. Initially **both the** solicitors and researchers working on the case need to become thoroughly versed in the scientific issues under scrutiny. Only then will they be able to make an informed choice of experts. It takes time to find out who are the experts in a particular field. One also must ensure that one's experts are known as impartial. The opposition will investigate each experts' background in detail. Any evidence of bias will be drawn to the courts attention during cross-examination. This is especially important for the Plaintiffs. Judges seem inclined to view scientists working for industry as impartial and those with substantial contacts with pressure groups as potentially biased. In the Sellafield case a large proportion of the Plaintiffs experts came from abroad, not only because they had expertise unavailable in the UK but in some instances because they were not dependent on research grants given by the nuclear industry in the UK.

The other type evidence presented by Plaintiffs is that obtained through "Discovery". In the UK the rules concerning discovery are extremely powerful and the Defendants are under a strict duty to provide all documents in their possession relevant to the case apart from correspondence with their solicitors and those produced as a re suit of the legal proceedings. A common trick of Defendant solicitors is to delay production of discovery documents so that the Plaintiff 's solicitors and experts have as little time as possible to review the documents and ask for further documents. It may be necessary to apply to the court for an Order that the discovery documents are produced within a specific time scale. It is not unknown for the discovery documents most useful to the Plaintiff's case to appear in the last lists produced by the Defendants

Standard of Proof Required for Causation

In UK civil courts the Plaintiff is required to show that "on balance of probabilities" the Defendants activities have caused the damage. In other words, it is at least 51% more likely than not that the Defendants activities are the cause. By comparison scientists demand a higher standard of proof. Most scientific journals will not publish papers showing an association where this is not statistically significant.. Conventionally statistical significance is said to be reached where it is calculated there is a less than 5% likelihood that chance is the explanation for the association..

When to Take Legal Action

Despite the publicity that a legal case can bring to an issue it should not be contemplated unless there is a good chance for success. Firstly because one is raising false hopes in the Plaintiffs, who have already been victims. And secondly because the money that would be spent on legal costs could be more productively spent elsewhere.

Running a case of the complexity of Hope & Reay -Vs- BNFL is expensive. **To have even a chance of winning Plaintiffs must be in a position to have expert evidence of similar quality to that of the Defendants and also the facilities necessary to respond quickly and efficiently as the case proceeds. The total amount spent by the Defendants and the Plaintiffs in the Hope & Reay -Vs- BNFL is estimated to several million pounds sterling. Similar cases are likely to be expensive in whatever country the action is taken.**

Hope and Reay were funded by the Legal Aid Board in the UK. This government body provides financial aid for legal costs to persons on a low income where there is a reasonable chance of their case succeeding. If Vivien and Dorothy win, the Legal Aid Board will recoup it's costs from the Defense. If they loose, the board will have to bear the costs for the Plaintiffs case although neither they or Vivien or Dorothy will have to pay the legal costs of the Defense.

Despite the above, legal proceedings should be considered where is no prospect of the polluter compensating a victim or even making it's activities less harmful. A successful case is very convincing evidence that an industrial plant is causing damage to its local community, and a step towards halting damaging activities. If the claims by Vivien and Dorothy succeed, this will profoundly influence public opinion towards considering the Sellafield plant responsible for the cancer excess in it's vicinity. By contrast it may take years for a definitive statement regarding this effect to emerge from the scientific community. But most importantly a successful claim will enable victims suffering today to gain some compensation for the damage they have suffered and recognition that they have been wronged.

Sara Downs 7 September, 1993

Much A Dooum on the Cooum

The first fortnight of October witnessed hectic activity on the banks of the Cooum in Madras. The notorious stench of the river was forgotten as hundreds of workers were pressed into action building a temporary embankment. 880 trucks were put to use dumping over 16,000 tons of gravel and 10,000 bags of sand. The reason behind all this activity was fear of radioactivity. Some disgruntled employees belonging to an American company, Haliburton Offshore Services Inc., had thrown three radioactive sources into the river. This company was engaged in off-shore oil exploration work and following the incident, the Atomic Energy Regulatory Board (AERB) directed Haliburton to suspend well logging operations in five western region rigs and two southern rigs.

Haliburton is the largest US. company supplying equipment to the oil industry. It is a subsidiary of the McDermott Corporation, whose primary nuclear subsidiary is Babcox & Wilcox, the compan that designed and engineered the il-fated Three Mile Island reactor. In recent years Babcox & Wilcox has specialised in fuel fabrication and reactor engineering for the US. Navy's nuclear submarines.

Newspaper estimates put the cost of building the embankment, which had an internal diameter of five metres, at around Rs 40 lakhs. A giant excavator was pressed into service and a hollow cylinder was lowered into the river

High Explosives Seized at RAPS

Explosive material was siezed by the Rawatbhata police form outside the premises of RAPS 3 & 4. This includes 51 bags each of 2.78 kg of gelatine powder and 46 bundles of fuse wire. A case has been registered under section 5/9 of the Explosives' Act against ShriSafiMohammad and Santosh Kumar, lincensed blasters who had been hired by some of the contractors of RAPS 3 & 4 for unauthorised blasting. The matter is still under investigation by the police at Rawatbhata.

7.2

and water was pumped out. Remote controlled equipment was used to extricated a two and a half inch long capsule containing about 150 gms of caesium-137. This was done on October 17th. A further four days of effort was required to retrieve the two americium-beryIlium neutron sources. Divers went diving in the stinking slush of the Cooum and they used the most sensitive equipment—their feet—to locate and retrieve the lost sources. Now there is the question of what to do with the embankment. Some have suggested that a park be built there but any permanent structure at the mouth of the river would interfere with tidal back flows into the river. Of course the cost of dismantling the structure would be at least, another 40 lakhs. (Just for information sake, could a reader from Madras please inform us as to what was finally done?)

While the dedication and the effort displayed by Dr Gopalakrishnan (Chairman, AERB) and other members of his team in trying to recover the lost sources is worthy of commendation, the same cannot be said regarding their efforts to inform the public. Here the age old mindset of "allaying public fears" by hook or by crook held sway. Dr R Chidambaram, the head of the Atomic Energy Commission went so far as to claim that "No harm will be done even if the sources remain in water and slush for a thousand years." Dr Gopalakrishnan was a bit more circumspect claiming that "it was unlikely that any leakage of radioactivity can take place from these sources as the radioactive material in them is in a physical and chemical form where its teachability in water is extremely low." He also observed that "Cooum water is not potable and it is not used for industrial purposes either."

After the recovery of the caesium source Dr Gopalakrishnan made a more relevant pronouncement. He said, The gamma source (caesium) which we have taken out will emit 5,000 rem per hour on contact and the high dose of radiation will cause severe burns if the capsule was held by hand directly. But once it was put inside the container with lead shield, the radiation outside the container is only 10 millirem per hour, which is acceptable."

While information regarding the activity of the two americium-beryllium sources was published in the newspapers (18.5 and 0.5 curies respectively) no information was forthcoming regarding the activity of the more pene trating caesium source. However, from the fact that it was emitting 5,000 rem at contact one can estimate that the capsule contained about 150 gms of caesium with an activity of 15,000 curies. This represents an enormous amount. For comparison one can only mention that the entire amount of caesium that was deposited on the whole of West Germany following the Chernobyl accident was estimated to be just 100 gms. This amount was sufficient to cause a measurable increase in neonatal mortality and in the number of birth defects in children con ceived during the period. The same amount of caesium was responsible for the horrible accident involving a similar radioactive source at Goima in Brazil in 1987, in which four people died of acute radiation sickness and more than 240 were contaminated and which resulted in social ostracism of residents of the whole city of over 1 million people.

The statements by nucleocrats instead of allaying fears are more likely to add to public anxiety because they do not gel with their own hectic activity If the material was so harmless then why expend this huge effort and money to retrieve the sources? Obviously, nucleocrats did not consider (and very rightly so) the sources to be incapable of causing grievous harm. Although the source might have been in a chemical form which was insoluble in water, at the time they were thrown in the river, there is no guarantee that the material would not react with salt water and produce chlorides of cae sium which are certainly teachable. After the sources were recovered, they were handed over to the police for getting the clearance of the court and for restoring to safe custody' of Haliburton Inc. Although the caesium source by then was securely placed within its lead shielded casing and emitting 'only' 10 millirem per hour, still these 10 millirems are likely to add up to something well over a few hundred millirem for the poor policemen whose duty it would be to keep a watch over the room where the sources were kept. Were these people informed of the risks they were running guarding the property of Haliburton Incorporated? The acceptable' (according to nucleocrats themselves) limit for ra diation dose for the general public (ineluding members of the police) is |ust 100 millirem per year

The incident on the Cooum brings into focus some points regarding the use of nuclear energy. One of the slogans used by antinukes in Europe after the Chernobyl accident was "Chernobyl is everywhere." This incident illustrates the truth behind this expression. Nuclear poisons can cause devastation and these poisons are not confined to nuclear reactor sites. They are in use in hospitals, industrial units, universities and laboratories and oven in the field offices of multinational cor poration like Haliburton Inc.. where their disgruntled employees can easily lay their hands on them Thousands of people have access to them. To expect that all these people would behave in an exemplary and responsible manner while dealing with these dangerous materials, is to expect too much. This makes the nuclear issue a matter of concern not only for those unfortunate enough to have a nuclear establishment in their vicinity, but for everyone. There is a lesson for nucleocrats. as well. Their knee-jerk "allaying of public fears have made even their well meaning words and actions suspect in the eyes of the public What they needed to do in this case was to take the opportunity to educate the public. Given out all the technical information so that other independent 'experts' could have formed their own conclusions and quantified the risk as precisely as possible so that the public would understand what was involved and what measures to take. The other lesson concerns us as a nation in this era of globalisation. Multinational overseas adventurers like Haliburton would become more and more involved in the 'discovery' of India. Unless they are severely and strictly regulated such incidents involving dangerous and toxic poisons will become more and more common in the days to come.

Sanghamitra

Are Multinationals Above The Law?

The Rules

If a radiation source is proposed to be handled in an open field, prior approval of the location where the source is proposed to be handled should be obtained by the user. Such open field application could be undertaken **only** when a) it poses no radiation hazard to those present around the proposed location of use and b) adequate space is available, to cordon off suitable area in order to ensure that no worker or member of the public would receive amounts of radiation dose in excess of specified limits.

The source of radiation should be safely stored in a location which is **duly** approved. The storage should be chosen that it would be free from potential fire-hazard, flooding, water-logging, etc. Further, to avoid loss by pilferage or otherwise, adequate security should be provided for the source of radiation.

Personnel who would be actually working with the source of radiation should be regularly monitored for the amount of radiation dose received by them in the course of their work.

Depending upon the type of use and the nature and amount of radiation sources handled, the applicant should be equipped with safe handling accessories as specified.

Has The AERB Taken Any Action?

It is obvious from the above that the dumping of radioactive sources in the Cooum River is a gross violation of the rulesl regulating the use of these sources. The responsibility lies not\ only with the disgruntled employees but also with Haliburtonl which failed to provide "adequate" security? Now that negligence on part of this multinational has been prima facie established, will the AERB take legal action against the company for endangering public health and safety. Or is the Atomic Energy Act only meant for desi activists ?

Rally at Rawatbhata

are than 500 people from Rawatbhata township and **surrounding** villages took out a rally on 26th of OctoDerJ993, to protest against the harmful effects of radioactive emissions from the nuclear power plant and against the dishonesty of the plant authorities.The rally gave a memorandum to the local assistant collector. The memorandum listed many demands which included demand for the construction of a referral hospital at Rawatbhata especially in the context of the increased morbidity due to nuclear pollution; facilities for treatment at the plant hospital in Rawatbhata in the mean-time; the closing down of the damaged unit-1 which has cracks in the end-shield; training for facing of emergency situations; construction of side roads and the establishment of a college and a technical school at Rawatbhata. The Assistant Collector promised to connect the nearby villages with the Rawatbhata grid by November 2nd, 1993.

After the rally, there was a public meeting at the market square of Rawatbhata, where villagers spoke of their difficulties. One of the major concerns expressed by a number of villagers was the absence of reliable electric supply. They said that the one 'benefit' for which they had paid an enormous price, was being denied to them! They had not only faced eviction from their ancestral lands when the dams were constructed but were now undergoing severe hardships due to diseases caused by radiation pollution. Shn Mangilal Gujjar of Loharia village said that he had within the last two years taken 128 patients from his and surrounding villages to Udaipur for treatment of T.B. The sarpanch of Eklingpura described how because of absence of roads, severely ill patients had to be carried on a cot. He said that we provide thembasic necessities like milk, vegetables and cereals, why can't some of the budget be spent on our wellbeing? Dr Rampratap Gupta, said that despite the billions spent on the construction of two hydroelectric dams and two units of the nuclear power plant and heavy water plant, there is growing poverty and unemployment in the region, and a great paucity of educational and health services. This was proof that our planning process was defective and had not contributed towards the benefit of the majority of our population and we needed to rethink our developmental policies. Surendra and Sanghamitra Gadekar of Anumukti also spoke at the meeting. They talked about the implications of the results of the survey on the health of the people living in the vicinity of the plant and also about the need for continuous monitoring.

The chairman of the Parmanu Pradushan Sangharsh Samiti, Shri Ratan Lal Gupta said that various small accidents that had taken place in both the nuclear power plant and in the heavy water plant were just warnings that Rawatbhata was sitting on a time-bomb. He warned the authorities that if the demands of the local population were not granted then the public would be forced to take recourse to agitation and legal redress. The meeting ended with a firm resolve to continue the struggle.

Physicians call for a boycott Siemens

The International Physicians for the Prevention of Nuclear War (IPPNW) is calling for a worldwide boycott of medical instruments supplied by the Gernan company Siemens. IPPNW, a federation of national physicians' groups in 80 countries is demanding that Siemens leave the nuclear business. The announcement came at a press conference in Munich on 9th of August when Michael Roelen, Secretary of the German section of the organisation, said that begining from September 1993, physicians belonging to the organisation including the 10,000 members of the German section, are being urged not to buy Siemens' products any more.

A spokesperson for Siemens AG. Norbert Bocker, has said he wanted to begin a dialogue with the IIPPNW. but the call to boycott might not be favourable for such a dialogue. He said that it is still too early to take legal steps, implying that the company might take the physicians' organisation to court over the boycott.

The boycott is part of an international campaign by the IPPNW which aims to ban plutonium production by the year 2000. From what Till Bastian, former secretary of IPPNW said, the action should be seen as "an 'ncentive" to the company to get out of the nuclear business. Its share of the nuclear-related work has already fallen from 20 percent to two percent, according to IPPNW estimates The or ganisation also wants an end to the production of MOX fuel rods in Siemens' Hanau plant.

An IPPNW study Plutonium: *Deadly Gold of the Nuclear Age* published last year warned of the dangers of approximately 520 tonnes of plutonium currently existing world-wide. Plutonium should no longer be treated as a 'raw material' but as what it really is a deadly poison.

WISE News Commurvque:397 3.9. '93,

Australian Environmentalists Block a New Reactor

Like India, Australia has a nuclear establishment—sort of. It does not have the kind of facilities that BARC has—indeed it hasn't got BARC's bite—but there is a nuclear research establishment, conveniently situated between a national park, a vast rubbish dump and the fastest growing suburban area in all Sydney. A perfect site for a reactor.

The reactor concerned isn't much to write home about either. In 1954 British announced they would give one in exchange for the privilage of using the Australian desert to test nuclear weapons. The reactor was completed in 1958 and entered full-power operation in 1959.

The reactor is known as HIFAR' (High Flow Australian Reactor). It belongs to a small group of similar reac tors whose design dates from 1954, when it was 'the state of the art' for research reactors. Two similar reactors. DIDO' and PLUTO' were built in England at the Harwell research establishment, and have now been in shutdown after doubts were raised about their safety by a senior Harwell engineer. Another similar reactor is operating in Denmark, but with advanced equipment that HIFAR hasn't got. Another in Germany has been rebuilt at vast expense, as has one in Japan.

In the early stages of HIFAR's operation, research was done in areas of material testing, (for power reactors) and neutron scattering. A lot of money was wasted in trying to design and test materials for a beryllium moderated reactor for use in desert areas a project which, when it was abandoned, left behind lots of waste that is still lying around. Weapons-related research was also carried out, and an Australian nuclear weapons lobby emerged.

By the 90s it was clear that Australia wasn't going to have either nuclear weapons or nuclear power, and HIFAR was left without a role. At the same time, major problems were starting to emerge with HIFAR safety: The cooling system in the reactor's thermal shielding had cracked and thousands of gallons of water were leaking into the room below where pumps for the

October/November 1993

heavy water were situated. Problems had also emerged in the heavy-water heat exchange system.

'ANSTO'—Australian Nuclear Science and Technology Organisation (the successor body to Australian Atomic Energy Commission),, has a problem in justifying its existence, and the large amounts of taxpayer dollars needed to keep it afloat and to keep the now well and truly aging HIFAR operating.

ANSTO saw salvation for HIFAR and itself in two areas: neutron scattering research and radioisotope production.

Neutron scattering, according to ANSTO, is one of those wonderful 'cutting edge' technologies that will lift Australia from its antipodean slumber and propel it into the 21st or 22nd century, while radioisotopes production will save the lives of all those whose trip into the 22nd century has been too much for them, and who have developed cancers or heart conditions.

So, what is 'neutron scattering'? Neutron scattering involves the penetration of matter—bits of plastic, metal or pharmaceuticals or whatever—by beams of 'cold', 'hot' or 'theremal' neutrons to examine its structure. Neutron scattering has been done at HIFAR for many years but it has singularly failed to galvanise the Australian R&D scene. A few dozen researchers perform esoteric experiments on 'Kondo' systems, spin glasses and supermagnets. They are mostly costly experiments. The queue of eager corporations waiting to do market driven R&D on HIFAR just hasn't materialised. It is the same situation all over the world.

ANSTO rather believes that HIFAR is out of date and needs upgrading. They now want a new reactor with three times the flux, one and a half times the power and the latest in equipment. A careful look at ANSTO's own figures however, showed that even a new state of the art reactor, —a mere snap of course at $200—400 million, will in fact put Australia about 12th or 13th in the world neutron scattering stakes. Hardly an impressive achievement! This reactor would be the single most costly item in Australia's R&D budget for many years. Meanwhile, programmes like solar energy, in which Australia at one time used to lead the world, have long since migrated to California and Japan where there is much less sun. Is this really the sort of priority Australia needs to propel it into the next millenium's technological wonderland.

Friends of the Earth, Sutherlandshire Council and Greenpeace have all spent the last six months arguing before a commission of enquiry that this is not an appropriate way of spending taxpayers' money and arranging among other things, for the commissioners to talk to that Harwell engineer who voiced doubts regarding the safety of HIFAR's brethren, DIDO and PLUTO. We have burned the midnight oil going through ANSTO's own figures with a fine toothcomb (well, actually a pocket calculator) and spent hours on the computer, the fax machine and the phone. We told the commission that a new reactor was a waste of money and HIFAR itself is an accident waiting to happen and should be decommissioned immediately. We pointed out the potential problems with HIFAR's emergency shutdown system, its lack of a backup shutdown system, and problems with the the uninterupptible power supply which in their own words, "has never operated satisfactorily."

In addition, we pointed out that most of the research that goes on at ANSTO's Lucas Heights site is in fact not reactor dependent at all, and neutron scattering is, in fact, the second smallest programme at the site, with far more effort going into other fields of research. If HIFAR were to disappear tommorow, most of these programmes would be largely unaffected. The only research programme that would actually disappear would be the neutron scattering programme itself.

ANSTO, as well as arguing the merits of neutron scattering as an entree to the next millenium, argued.that HIFAR was needed to produce medical isotopes. It turns out that the 'cutting edge' of medical radioisotope technology are accelerators. Many of the isotopes that, according to ANSTO, could only be produced in a reactor, turned out to have active accelerator production programmes elsewhere.

The inquiry's most important conclusion was that ANSTO had failed to make a case for a new research reactor, and therefore, the commission "could not recommend its construction". The commission however, went on to suggest that HIFAR be refurbished—something ANSTO had said "wasn't practicle". It failed to acknowledge the safety problems at HIFAR. Thus the challenge to convince the people and the government that HIFAR should be shut down and Australia should withdraw from its ill-considered involvement in the nuclear fuel cycle, remains.

John R Hallam
6.10.1993

Evolution of an Activist

How I was awakened to the reality of nuclear affairs? In 19851 had a chance to visit BARC in connection with some heating device they wanted. I had known by then that nuclear plants meant many fishy things but had not reached a decision that I would have nothing to do with it. Once inside the BARC, I found it very impressive, almost like a place from a science fiction story. At the nuclear fuel complex, I met a 'scientist named Mr Khurana.

Clad in orange with a picture of Rajaneesh on his chest, he seemed quite at ease in the middle of many strange activities. These are some fuel rods for machining—weH, they have extremely low levels of radioactivity. It cannot penetrate even the skin." I was a little uneasy but walked on bravely with him till we came to a big iron gate because here even the scientist said that the radioactivity could be higher. On his pushing a button, the gate opened sideways and we saw in front a crucible containing uranium oxide for which an ignition device was required and which could be operated without going any closer. I asked what could be the radiation level where we were standing and the answer was that the man who monitored it was on leave.

A few months later we had Chernobyl. That same year it was my previlage to experience the awesome beauty of the Periyar lake in Kerala and later on learn about the poisoning of the Periyar river by the Indian Rare Earths Ltd. (IRE) plant at Alwaye. I could not sleep well because I had done business with IRE...

. ..While going through the account of your cycle yatra I had a strange feeling which I would call healthy jealousy. Every day there are several reminders of the prison that I have created around myself but the cycle yatra also reminded me of the possibilities of fulfilling childhood dreams of adventure with a much greater meaning! I don't know exactly when, but some day I am bound to join you people in your yatra...

I have been trying to gather more information on the Narmada project. It is very distressing to realise that the Gujarati press refuses to see the problem of rehabilitation as it reality is. Even if we accept that the 19 villages of Gujarat can be rehabilitated, it is no more than a small fraction of the task. One hopes that as time passes the real nature of the project will become clearer to those who believe it is inevi table and that there will be a united front of all activists who will support the villagers who will be refusing to move.

Kersi Sabavala

read the news of Kersi Sabavala's untimely death in the newspaper. There it was in black and white Kersi Sabavala is dead. He died suddenly following an attack of malaria just after returning from a business trip to Bombay He was just forty. Even though now more than two months have passed, it is still difficult to adjust to the fact. Wasn't It only yesterday that Kersi had come for the first and alas only time to Vedchhi and we had spent half the night talking? He had said that he would visit again soon and stay at some length and enjoy the peace and maybe write something for *Anumukti.*

I first met Kersi four years ago at a meeting of the Narmada support group in Ahemedabad. After that we met somewhat infrequently at different places usually at some protest action or meeting connected with the Narmada agitation. Superficially, I knew him very little, but deep down I felt we were kins.

Kersi's support to Anumukti during the last four years was extensive and steadfast. From collecting money to putting an advertisement for Anumukti in various 'mainstream' fora, Kersi did it all. Anumukti deeply regrests his death. Below we republish excerpts from some of his letters to Anumukti as a mark of respect.

Blacklisting Nuclear Power

The following is the full text of the letter Kersi wrote to Nuclear Power Corporation on 11th of April, 1990.

We have received your tender enquiry (No:CMM/KAPP/4920). We manufacture a wide range of ovens and furnaces. But as a matter of principle we do not deal with organisations concerned with atomic energy generation. Our stand is based on the following facts:

- Nuclear energy is the source of one of the most dangerous kinds of pollution. Radiation at any level is harmful to life and environment.

- As radiation cannot be measured by ordinary means nor can be sensed by the people, atomic enery experts have succeeded in keeping the population in the dark.

- The harm that the radiation can cause may not be felt in the near future but can be passed on to the coming generations in the form of damaged genes.

- This subtle violence against life and nature is irreversible.

- There is no method yet devised to dafely decommission a ractor after ist short life of 25 years or so is over. This is a totality unjustifiable liability we thrust upon generations to come.

For perpetuation of the evil of nuclear energy its various agencies are controlled by the power of the state. In countries where people have a say, the dream of nuclear energy has evaporated.

There is always the possibility of a major accident like that of Chernobyl as even for the most perfect machinary the human factor cannot be wholly eliminated.

Nuclear power generation is a big drag on the progress of a poor country like India. With the same amount as sunk in this large scale ego trip, a lot more power can be generated in a decentralised and safer way.

The cover-up provided by the government to nuclear energy establishment in the form of the Atomic Energy Act is contrary to the spirit of democracy.

- The nuclear establishment has kept alive the option of a nuclear bomb which is madness of the highest level.

In view of the above considerations we have no option but to blacklist your organisation.

Subscription Information

Rs. 30/~ per year (6 issues) within India
U. S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/- Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, 394 641India

Please do not send personal checques or drafts addressed to Surendra Gadekar

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Published by S Gadekar for Sampoorna Kranti Vidyalaya and
printed at
The Parijat Printry, Ahmedabad

PRINTED MATTER **BOOK POST**

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 7 Number 3

December 1993 /January 1994

Big Dams Spawn Nuclear Power Plants

During a cycle yatra through Narraada valley in 1990, we were often confronted with the question, Are not nuclear power plants the alternative to big dams? We oppose big dams because they cause submergence and destruction. So, how can we oppose nuclear power plants as well? We do need electricity for progress!

The fallacy of regarding nuclear power plants as alternatives to big dams or coal powered plants is a common mistake and occurs because of the perfectly reasonable assumption that since both generate electricity, one can substitute for the other. The truth, is however, very different. Big dams are the mother of nuclear power plants.

A look at the map can clarify the confusion. Rawatbhata Atomic Power plant was built on the banks of the Rana Pratap Sagar reservoir. There were three other dams built on the Chambal within just fifty kilometres. All with electricity generation as a prime objective and yet not only RAPS-1 and RAPS-2 wore built, they now want to build another six reactors at the same site. Similar in the case of Kakrapar Atomic Power Station. The Kakrapar and Ukai dams were built as a multipurpose hydel scheme on the Tapti in the 1960s. The hydro power generation has been far less than what had been expected earlier. The dams were followed by the Ukai thermal power station and now by Kakrapar Atomic Power Station. Here too, although only one reactor is presently operating and another under construction, the site selection has been done with a provision for four reactors. If the neighbouring population were ever to resign itself to nuclear power, and if the Nuclear Power Corporation were ever to get some extra cash, Kakrapar too would soon sprout two

mora reactors.

But nothing illustrates the 'family' relationship of nuclear power plants and big dams better than the case of Kaiga. (See "Kaiga left high and dry" in this issue.) Here the construction of two reactors has been going on at full speed with the consequent destruction of the little bit of tropical rain forest still extant in the Western Ghats but the dam which was to provide the water for cooling the plant has got delayed since the World Bank has withdrawn funding and there is some dispute between the contractor and the Karnataka Power Corporation. (1 never thought that a day would come when I would feel thankful towards the World Bank and dam building contractors, but one lives and learns.)

The fact in that nuclear power plants are thirsty beasts. Huge amounts of water are needed to take away the enormous heat generated within their bowels. A 1,000 MW reactor requires about 50 cubic metres of How per second. This is nearly the flow of a good sized river or a large canal, To reduce the requirement of water, new plants have gone over to the 'closed circuit', where the cooling water is recirculated after cooling in cooling towers. For those systems although the amount of water required becomes much lean (around 3 cubic metres for a 1,000 MW plant) it is still substantial. In times of severe drought, when electricity would be most needed because of the shortfall in hydro generation and the greater need for irrigation, nuclear power plants may become inoperational because of lack of cooling water. This has happened in Prance. Nuclear power plants can thus only be built in the vicinity of large bodies of water and these large water bodies are most easily created by damming rivers.

At the time when dams are planned, nobody, not even the nuclear lobby thinks the imminent appearance of a nuclear power plant in the intermediate future as a 'benefit'. Amongst all the claimed benefits of a dam, power, irrigation, flood control, fisheries, compensatory afforestation, bringing tribals and other displaced beings into the 'mainstream', etc. there is never even a mention that soon the place will become a site for a lovely 'clean', safe and too cheap to meter nuclear power plant. Yet, as we see in all the cases mentioned above, these calculations are made by the policy makers sometimes many years in advance. Kaiga is illustrative, only because perhaps these calculations had not been made and Kaiga was chosen as a site in something of an unusual hurry and thus we have the beautiful prospect of the Nuclear Power Corporation losing Rs 1 crore every day in interest charges while the Karnataka Power Corporation and its contractors haggle over prices.

There is a lesson in all this for antinuclear activists. The proper time to oppose nuclear power plants is before the dam has been constructed. If they can prevent the dam from being built in the first place, nuclear power plants and the almost equally obnoxious coal burning power plants are unlikely to pollute the vicinity. Often small landholding farmers support dams in the hope of irrigation, but if they were to know that irrigation is only a bait while the radiation hook is being readied, they would perhaps be more circumspect in their support for sundry dams of dubious value. Peringome in Kerala is en example of the way governments operate. When they found the opposition to the atomic power plant too hot to handle, talk of the plant was quietly shelved but work has started on the Kakkadavu dam. Once the dam is made, the sword of Democlese would continue to hang over the people of Peringome and Opposing the momentum for the power plant would become much harder.

Surendra Gadekar

Froth the

hat are the alternatives? is a question often thrown at activists opposing any mega project. The question is posed in an unfair manner. The activist is supposed to come with a detailed blueprint with costing and time frames snowing how the 'alternatives' would replace whatever 'benefit' the megaproject was supposed to confer. In the case of power projects, this means accounting for each and every kilowatt with costs worked out to the last paise. It does not help to point out that the lobbies behind the megaproject are paid huge sums of money from the public exchequer to do 'feasibility'studies and impact assessments while the activists have to pay their own passage. It also does not help to point out that the 'experta'advocating the project have invariably been wrong in their cost and benefit calculations in the past. The figures they pop up with so much authority have no relation to reality. The public feels that the activists do not have the proper grasp of the issue which the 'experts'have. Crying about the unfairness of it all, is all that activists most often do.

India is the land of voluntary efforts and one comes across people (even experts) who are willing to give their time and expertise to do these detailed cost calculations with no thought of monetary recompense. Dr. Amulya Reddy and Mr. Girish Sant have done such an analysis with regard to the power generation from the Sardar Sarovar Project. They presented their analysis (with all its gory details and annexures) to the Sardar Sarovar review board. They show that not only are the alternatives environmentally far less damaging and less destructive of people and cultures, they are also much cheaper. Instead of adopting these simple and steps which would reduce demand and help progress towards a more just and equitable society, Mr. Praful Bidwai's article shows what our government is in the process of actually doing—selling the country to foreigners and locking us into extremely expensive power supply.

There is no reason at all why we should not adopt the sensible solutions outlined by Dr. Reddy and Shri Sant to our electricity problems except that they require mobilisation of effort on part of a large number of people and our government is too laiy and corrupt to act, and we are too laiy to force it to act.

Does Sardar Sarovar Make Sense as an Electricity Generation Project?

Amulya Roddy and Girish Sant

The Sardar Sarovar Project (SSP) has both an irrigation and electricity generation component, but this presentation will restrict itself to the electrical part of the project which accounts for 56.1% of the costs and involves a 455 ft embankment that would create a reservoir and lead to the submergence of 240 villages, 40,000 families, 39,000 hectares of land (of which 13,744 hectares is prime forests).

This electrical part of the SSP may be considered to consist of three components:

- **Conventional generation from a 436 ft embankment reservoir**
- **Pumped storage generation from the same 436 ft reservoir**
- **Generation from an 19 ft increment in height to the 436 ft**

Conventional feneration

If one thinks of a hydroelectric project as being based on a waterfall with a high head, then it is important to note that the SSP is not such a project—it is, in fact, a mega-tank where the head is created by the wall or embankment of the tank.

Further, if the downstream canal system is built and in place when the dam is built, than the water can be evacuated from the reservoir as and when required for irrigation and other end-uses of water—and there would be little water available for electricity generation. However, it is envisaged that the canal system cannot be completed before 16 years. *The* situation is quite analogous to many electrical projects where the transmission and distribution are not erected in time to evacuate the electricity that is generated.

This mis-match between the gestation periods of the dam and the canal system has led to the idea of generating electricity from the un-evacuated water. The SSP has two different power stations-a large River Bed Power House (RBPH) of 1200 MW capacity with reversible turbines that can be operated either as pumps or as generators, and 250 MW of conventional generation capacity at the Canal Head Power House (CHPH).

River Bed Power House

The River-Bed Power House is planned to generate electricity in two distinct modes:

- **Conventional (or seasonal) generation from the excess water released through the RBPH into the river below the dam after providing for irrigation needs. A large share of generation at SSP would be provided through this mode of operation. As the canal system is built up and is able to withdraw the water, the capacity for conventional generation goes down—and after 15 years, it will go down to 0 MW in the RBPH and 50 MW in the CHPH making a total of 60MW Thus, conventional generation will decline from a firm initial 439 MW to 50 MW after 16 years. So, in costing the conventional generation component of SSP, it has to be treated as a hydroelectric project with a lifetime of 15 years and a declining capacity during that lifetime.**
- **Pump- back (reversiblo) generation. When excess water is not available for power generation, water stored in a small dam at Qarudeshwar weir is pumped up (by reversible turbines drawing power from the grid) to the SSP dam reservoir at certain times and is allowed to fall back through the RBPH and generate power at other times. This mode is designed to satisfying peak demand for electricity at certain hours of the day, for instance, during the evenings. (About 30% of the original energy drawn from the base-load plants is lost because reversible generator/pumps are not capable of converting the energy with 100 percent efficiency.) In effect, the SSP acta as a "hydel battery" that is charged at night using power from the thermal plants and is discharged to provide power during peak demand.**

Canal Head Power House

The CHPH, with conventional (non-reversible) turbines generates power using water flowing in the canals and excess water during monsoons.

The water required for irrigation paseee through the CHPH and is then stored at the canal head regulating ponds. This stored water can be discharged into the canal depending upon demand. These canal-head regulating ponds spread over 773 hectares facilitate CHPH operation in the peaking mode.

During the monsoons, the water is diverted to the RBPH on a priority basis. The remaining excess water is passed through the CHPH

and then released into the river. This seasonal generation will decline as the irrigation network grows.

Overtly Optimistic Estimate

Both World Bank and Central Electricity Authority have made studies of the electricity generation from SSP. However, both these studies over-estimate the peaking conventional generation on two accounts:

- **1. They assume larger regulated water releases from Narmada Sagar project than is likely to be the case. With the delay in the construction of Narmada Sagar Project, the conventional generation is expected to fall by 25% to 28%. The decline in firm generation is likely to be much more. As a consequence, the pump-back mode of operation will dominate more over conventional peak generation than anticipated.**
- **2. Narmada's water flow has subsequently been estimated to be 17.1% less than the flow assumption adopted at the planning stage. This too will decrease conventional power generation, making increased pump-storage operation necessary.**

The decreased magnitudes undermine SSP's usefulness, to a substantial extent as they would essentially convert SSP into a pumped-etorage plant. For pumped-etorage plants, many other better sites are available with substantially lesser submergence. The 1, 450 MW Pimpalgaon Joge Scheme requires less than 0.5% of the submergence of the SSP and costs about 25% less than SSP.

Sardar Sarovar Pumped Storage scheme has not been compared with other alternative supply schemes such as gas turbines and cogeneration from sugar factories. Demand-side management alternatives have also not been compared- This omission is particularly serious because the evening peak in Indian electricity systems is largely due to lighting, and drastic reductions in peak demand can be achieved by adopting efficient lighting devices.,(See the next article on Alternatives.)

Minimal Benefit From Monsoon Base load Powor

A sharp dip in energy demand describes the monsoon period (from the electricity board perspective). During this time, irrigation pumpsets which account for approximately 22% of average grid load, are virtually unused. Historically; the monsoon season is utilised to take coal based power plants sequentially off-line for maintenance. The drop in demand and the already low plant load factor in the Western grid, offer ample lee-way for removing these plants from service. Thus, peak-demand is the factor limiting the number of plants to be taken off-line simultaneously, not the base demand (which is relatively low).

SSP will produce the greatest portion of its energy during the monsoons. After 15th year of operation virtually all of the conventional generation from SSP will be at monsoon time. Existing base-generation is large compared to base demand, particularly during that period. This fact is evidenced by the unusually high grid frequencies during the off-peak hours of the monsoon (high frequency indicates excess generation). Only a small portion of SSP conventional electrcity generation which coincides with the peak demand will be of any real use. Rupees per kilowatt hour is hence a meaningless value for assessing SSP, since much of the electricity will be produced at times when there is little demand for it.

Submorgoneo Duo to tho Powor Component of SSP.

Though the SSP is a multi-purpose dam project, but at least a part of the submergence can be directly associated to the power component.

The Narmada Water Dispute Tribunal (NWDT) increased the Full Reservoir Level of SSP from 436 feet to 455 feet to capture additional generation of 250 to 350 million units per year. Since the height of 436 feet is sufficient to meet all irrigation needs, the increase in height entails an additional submergence of nearly 10.000 ha which is roughly 27% of the total submergence. The extra energy this additional height will yield (230-350 million units) is less than 10% of the total energy. For this trivial benefit, a tremendous price has to be paid—5 villages and an additional 9,500 hectares will be submerged, mostly in Maharashtra.

For operating CHPH (of 250 MW) as a peaking station, a temporary storage is to be created — the canal head regulating ponds or rock filled dykes. These ponds have water storing capacity of 24.25 MCM (million cubic meters). The area submerged by these ponds will be 773 hectares comprising of 5 villages. The pump-back generation at RBPH is made possible by a similar storage created by Garudeshwar Weir. This weir will submerge land on the banks of the river but no estimate of this submergence is available. Hence, a submergence of at least 10,800 hectares can be directly associated to the power component of SSP. This comes to 7.45 hectares per MW of installed capacity

SSP IN PERSPECTIVE

The SSP power plant, with an in stalled capacity of 1,450 MW, would account for only 5% to 69b of **the** total capacity planned for **the Western** Zone, by year 1997. Capacity **addi-**

tion planning is based on demand forecast studies. Some of the assumption© involved in studies of demand forecasts are erroneous. The latest demand forecast done by Central Electricity Authority (CEA) is the 14th Electric Power Survey carried out in year 1990. This survey assumes peaking availability—(at the bus-bar) of 59.5% for the Western Region by year 1994-95, An availability of 60.36% was already achieved in year 91-92. Further, the survey does not take into account other factors that improve peak availability, such *as* higher availability of new generating plants being added and continued efforts for renovation and modernisation.

Conclusions

There is no justification whatsoever for the negligible generation from the 19 ft; increment in the dam height

Conventional generation declines rapidly to a trivial capacity

The SSP Pumped Storage scheme — to compensate for the weaknesses of the conventional generation — is so intrinsically inappropriate and expensive compared to other options that it is like "throwing good money after bad".

A K.N. Reddy & Girish Sant

The Alternatives

Demand Side Management
A Way Out Of The Present. Mess

The fundamental purpose of the power sector is to satisfy demand for the benefits of electricity such as lighting, cooling$_f$ etc. Traditionally demand has been met by adding generation capacity The possibility of reducing electricity demand through energy efficiency while providing the same level of benefit has been largely ignored. Throughout the world it is now recognised that Demand Side Management (DSM) or efficiency improvement offers a significant and economical method for demand reduction, in effect diminishing the need for new installed capacity. In fact, saving 1 kWh is equivalent to generating more than 1 **kWh** because **the** saving is at the consumer end separated from the generation end by T & D lines with **their associated T & D losses.**

Iarge Savings from Energy Efficiency

Efficiency improvements can play a major and cost-eflective role in demand mitigation. For example, US. electricity demand was anticipated to follow GNP growth according to J 1973 utility forecasts. In fact, even though electricity service expanded because consumers bought additional appliances, etc., electricity use actually decreased and in 1986, the actual consumption was 50% less (1,160 billion kWh less) than. the projections. It has been estimated that the United states currently saves $169 billion per year as a result of end-use efficiency advancements which began in the mid-**708.** As technology evolves, the opportunities for energy savings Continually expand In 1991 US and Canandian utilities alone invested over Rs. 6,000 crores ($2 Billion) on DSM programs, a growing trend.

Opportunist to Surpass the Wort: The Urgency of Imptemtiitatkm

In the matter of efficiency improvements, India has a comparative advantage over Japan, that US, and Europe. In most Western countries, the cheapest efficiency measures have already been adopted during the last fifteen years as a result of which the efficiency of powre utilisation is relatively high. However, many of these very low-coat efficiency improvements have not yet been captured in India which can therefore enjoy much greater incremental energy savings per rupee spent on conservation measure.

In addition, the highly industrialised countries are hampered by comparatively long lead times in implementing energy efficiency improvements because they still have a largo stock of the less efficient infrastructure and equipment from the past. In contrast, in India, industries are being newly established or expanding, many consumers are purchasing their first appliances, etc, Hence, there is considerable scope for efficiency measures **and** an urgency to adopt them as soon as possible, before a wasteful infrastructure becomes established and inefficient equipment is installed. The savings benefits of efficient infrastructure and equipment **propagate** *over* time as do the losses from inefficient versions. Thus, as the nation's infrastructure is being estab-

Option	Life Cycle Cost Rs/kW	First Cost Rs/kW	Electricity Cost Rs/kWh
Compact Fluorescent Lights	13,852	7,611	0.57
Irrigation Pumpset Rectification	21,827	13,941	0.33
Pumped Storage Schemes	27,860	14,530	1.29
Gas Turbines	30,391	8,660	1.18
Cogeneration in Sugar Factories	35,252	28,380	0.69
Combined Cycle Gas Turbines	35,555	17,507	1.39
Efficiencient Refrigerators	36,094	33,954	0.39
Sardar Sarovar completed on time	37,807	30,301	0.96
SSP with a two year delay	45,746	36,665	1.16
Coa	61,808	31,269	1.29

Life Cycle and First Costs of Various Electricity Options

lished and equipment is being installed, there are unique opportunities to surpass western efficiency levels with relatively little financial outlay.

Costs of Various Options

Least Cost planning is fundamental to achieving the maximum benefit from limited resources. Presently, the Western Region is faced with serious, power shortages although the base-load capacity significantly exceeds base demand. Additional base generation is not needed and ties up additional capital. Therefore, one needs to focus on the cost of adding (or saving) a kilowatt (Rs/kW) of capacity during peak demand time. We have evaluated various energy options according to life-cycle cost and first cost per kW added/saved at the bus-bar. This avoids placing emphasis on the addition of unnecessary base capacity. The table compares the options, ordering them by increasing life-cycle costs. The Rs/kWh costs are also shown although they are not relevant in the case of SSP since SSP provides maximum power during the monsoons when there is the least need for it.

Life cycle Costs and First Costs

The results of the analysis carried out by the author regarding life-cycle costs and first costs of various energy options is tabulated in the table on previous page. Details of the the analysis, and the assumption used can be obtained by writing directly to the author. The assumptions and the calculations are transparent and any body can understand and repeat them. The procedure allows for different assumptions to be made and the resulting costs can be computed directly. All results are given as values for the Western region except Refrigerator efficiency improvements, which are all India figures.

The above table demonstrates that SSP is one of the costliest option for meeting peak demand (only coal power is more expensive). (Nuclear is even more expensive but has not been included in the study—*Editor.* For the same investment as SSP, the total cumulative potential of these other options is approximately 65% more than SSP capacity and they can all be realistically achieved by 1998—that is just a year after SSP is scheduled for completion.

Life-cycle costing forms the core of this approach. All direct costs and credits are accounted for and brought back to their present value. Energy was treated in a similar manner. Where uncertainty was involved in the assumptions, conservative estimates were adopted.

For fair comparison, each energy option is replaced after completing its useful life while accounting for all costs over its life-time. The time horizon for this analysis is equal to the economic life-time of SSP, viz., 34 years. For reality, raw data for the study was extracted from the results of actual energy projects. Accounting for the higher availability factor of new generating plants scheduled by year 1997, it is likely that an overall availability of 64.2% will be achieved. This improvement is equivalent to a reduction of about 1,222 MW on gross generation (at bus-bar).

The first phase of extensive renovation & modernisation efforts have already improved plant performance equivalent to 1,400 MW of capacity nationwide. The resultant cost of saved capacity is only Rs. 0.87 crores/MW Continued efforts are expected to further improve the availability of existing plants. Despite this, the improvement has not been incorporated in the present study because of inadequate data. But, these favourable factors should relieve concerns about the desperate power shortages expected in the near future.

The following sections elaborate on selected DSM options that have proven themselves feasible, quick and inexpensive. Analysis reveals several key advantages of these options over SSP.

Irrigation pump Sots (IPS) Rectification

IPS consumption accounted for 22% of the total Western Zone consumption of electricity (in the year 1991-92). Work, especially in Gujarat (by the Gujarat Electricity Board and the Institute of Cooperative Management, Ahmedabad, demonstrates that 26% energy savings are feasible by simple low-cost rectification measures in IPS. Extensive field experience with IPS rectification has also accumulated. For example, as of 1991 the Institute of Cooperative Management rectifted 5000 pumps using measures which yield from 26-50% energy savings. This work was also taken **over by GEB, which comprehensive DSM schemes have been formulated which take into account technical, financial, and political barriers to IPS rectification.**

Ughtlntf Improvements

Lighting drives the peak load in India, comprising 34% of that demand. As a financially effective and proven means for demand reduction, energy-saving lighting should receive priority attention in energy planning. Compact-fluorescent lamps (CELs), comparable to incandescents in luminosity, use just one quarter the energy of their counterpart while affording many additional benefits. Energy analysis indicates that even with only 25% of the household incandescent bulbs replaced, CFLs have the potential for saving approximately 640 MW of peak power in Gujarat, Maharashtra, and M.P. In a span of 5 to 6 years, a well- planned program can achieve this saving at a cost of Rs.l3,800/kW (this is significantly less than the Rs/kW for SSP).

Refrigerator Efficiency Improvements

Indian refrigerators perform well below world efficiency levels. Remarkable efficiency improvements have been made in many countries. South Korea's refrigerators provide an excellent example for India to follow or even improve on. Over a 7 year period (1980-1987) the energy use of their 165 litre refrigerators dropped 65% from 672 kWh/yr to 240 kWh/yr. A 200 litre Damsh model now produced uses only 90 kWh/year. Refrigerator performances, but similar sized Indian refrigerator use about 540 kWh/yr. The large gap between good and bad refrigerator performance in different countries shows that there is significant room for improvement in India's models.

Currently more than 1.26 million units are produced in India and the production continues to increase at a rate of 10 to 12% per year. The refrigerator stock is expected to grow from its current level of 7 million units to approximately more than 50 million units by year 2010.

Simple modifications in the refrigerator design (refer to footnote for the specific modifications) can reduce consumption up to 24%. These modifications can be implemented immediately by developing an agreement with manufacturers. An overall cost increase of Rs 500/refrigerator is expected for these basic modifications. A delay of jut 6 yearn in implementing simple and immediate refrigerator efficiency improvements, will waste energy equivalent of over 40% of the SSP's production over 34 years of economic life time. These simple efficiency measures, provide an estimated saving of 34% in the refrigerator energy consumption. These measure are implementable in a short time, with immediate results. As seen in the above table, they produce large energy savings at a low cost.

Industrial Efficiency Improvements

The rapidly expanding industrial sector today consumes about 45% of the nation's total electric power.. Energy is a bottle-neck to industrial productivity today. There are many low-cost measures to reduce or minimise energy conservation through efficiency retrofit. The national energy conservation center in Pakistan, Enercon, audited 43 industrial plants. A 22% energy saving is anticipated using only measures with a 6 month payback time or less. Numerous energy audit studies done by the National Productivity Council and other agencies demonstrate similar savings in India.

China's success in industrial energy efficiency advancement is also

worthy of note. A huge energy efficiency program implemented at the central and local level between 1981 and 1985. Investments totaling 10 billion yuan were applied towards the retrofit of existing equipment and the installation of new energy-saving equipment. This efficiency outlay amounted to more than 10% of the total supply-side investment in 1981 and 1982. Since that time, the proportion of efficiency investments in virtually all highly industrialised and some developing nations, has increased substantially.

Other Efficiency Improvements

Reduction of Transmission and Distribution Lossos

There exists significant potential for reducing T & D losses, and in-creasing electricity availability (at the user-end) in Gujarat, M.P. and Maharashtra. A brief summary of the current situation is given below — Korea has been included as an Asian example of low T & D losses. Over the last 20 years, Korea's T & D losses of 25% decreased to just 6% with the aid of a straightforward four- component programme.

Gujarat	*21.7%*
M.P.	*18.9%*
Maharashtra	*16.0%*
Korea	*S.7%*

Average Transmission & Distribution Losses

- Reduction of existing line loads to 75% of their rated capacity
- Addition of needed conductors to accommodate residual load;
- Installation of low-tension and high-tension capacitors to increase power factor levels;
- Utilisation of low loss equipment i.e. current transformers.

As a result of these measures, Korea's transmission and distribution efficiency now betters the US. by approximately 2%.

Fortunately, methods for reducing technical T & D losses are straightforward and do not require any advanced technologies. T % D improvement investments are frequently more cost-effective when compared to the cost of new installed capacity. A World Bank study in Sudan demonstrated that an outlay of Rs. 3 crore for static capacitors would yield a generation capacity savings of Rs 6 crore. The retrofit was intended to correct low power factors in the distribution network, a problem that is common in India.

Maharashtra's T & D system has improved significantly since its high of 17.6% losses in 1989-90, falling to 15% over the 1991-92 period. This encouraging trend is the result of recent loss reduction efforts by MSEB is still under—way (further reductions are expected). Gujarat and M.P. enjoy even greater potential for improvement with their present high T & D losses. The present allocation for T & D investments which is approximately 34% including outlays for lines and equipment, is quite low relative to the 45-55% expenditure of other countries. To gain the benefits of this environmentally benign resource, a larger proportion of the power sector budget — even more than for capacity expansion — must be allotted towards this resource.

Power Plant Tune up

De-rating of power plant capacity and low plant load factors (and plant availability) are common features of the power sector in India (and other developing countries). A1989 World Bank survey of 70 developing countries shows an extra generating capacity of 43 gigawatts (at a cost of about Rs. 150,000 crores) resulting from excess reserve margins due to the features mentioned above. A 1991-92 Economic Intelligence Service study of India reveals an average plant load factor of only 55.3%, demonstrating that existing capacity is significantly under-utilised.

Pakistan has experienced similar problems. A rehabilitation project now under way in Pakistan is designed to restore the original ratings of 15 steam and combustion turbine units providing an additional capacity of 120 mega-watts while halving the forced-outage rate. These benefits are derived with pay-back times ranging from 2 months to two years.

Thermal plants in the three states involved in the SSP realise only a 52.8% Utilisation rate, whereas 70-80% plant capacity factors are typical in other countries. Many opportunities for capacity improvement are available. Some older Indian thermal units have boilers which are not even configured to operate on high-ash coal, the primary, thermal fuel. While it is true that high ash coal use requires some additional maintenance, analysis indicates that in most cases maintenance is considerably more economical **than** equivalent new installed capacity.

A continued effort directed **towards** renovation and modernisation **to** improve the availability of **coat-baaed** thermal plants is now in **progress in**

Inda. In the first phase of this, an investment of Re 1,223 croree is expected to improve plant performance equivalent to adding 1,400 MW capacity (all over India, Rs 0.874 crores /MW of saved capacity). This process is expected to continue in the second phase and will improve availability of old plants above the 1992 level. A preliminary estimate indicates that this will be equivalent to a capacity saving of 1,600 MW (all India). The on going R&M for hydro power stations is expected to save another 846 MW capacity nation-wide.

Since this huge economic resource is in the process of being tapped, it has not been included in the present analysis as an alternative to SSP. But, it must be stressed that demand forecast studies have not recognised the reduced need for capacity additions because of these ongoing measures.

A kilowatt-hour saved is a kilowatt-hour made?

No!

A kilowatt-hour saved is equivalent to more than 1.29 kilowatt-hours generated at 22.5 % Transmission and Distribution losses.

Tims off day Tariffs and Load shifting

Many State Electricity Boards are actively thinking of introducing/strengthening Time-of-day (TOD) metering and two-part tariffs. This strategy encourages energy consumers to shift their load to off-peak hours using a variety of incentives including time-specific tariffs. Once the realistic cost of peak-time energy and off-peak-time (night time) energy is charged to the industrial consumers, sufficient incentive exists for them to alter their usage patterns. A survey of HT industries in Western Maharashtra has estimated that about 2.0% of the normal HT load can be shifted from peak to non-peak hours by managerial solutions, and 0.6% by staggering the timing of industrial operations. An additional 3.0% of the load can be shifted if some investments are made. This amounts to about 400 MW in the western Region by 1997. These measures art typically less costly and more rapidly implemented than capacity addition.

ENVIRONMENTAL & SOCIAL IMPACTS OF THE OPTIONS

Concern about the social and environmental costs of power generation has been increasing world-wide. Whether the source is Urge hydel, coal thermal, or nuclear, experts now recognise that the social and environmental consequences of power generation are large, Usually, these consequences are borne predominantly by the most deprived sections of society.

Environmental Impacts

The environmental impacts of SSP are known to be large, but their over-all effects have not yet been determineil. In the present study, therefore, alternatives to the dam were selected based on their cost and socio-enviroamental soundness. For example, efficiency improvement measures such as T & D loss reductions. IPS rectification and efficient lighting, use neither consumed fuel nor submerge land—their environmental impact is virtually negligible The first cost and life-cycle cost of these measures are also lower than SSP. Pumped-etorage generation typically uses energy supplied by coal plants. Hence the concerns related to coal combustion would also apply to this form of'hydel'generation. This concern also applies to the pumped-etorage mode of operation at SSP. However the alternative pumped-etorage schemes have every limited land requirements and consequent submergence.

Gas turbine thermal facilities enjoy many environmental benefits over coal thermal plants. Natural gas used in the turbines i» the clennest fossil fuel source. Also, there is little associated thermal pollution and sulphur emission from CCGT plants relative to coal power.

Cogeneration reduces sugar factory emissions because of the higher efficiency of combustion attained. The production in some cased divert bagasse, which can otherwise be used for making hard-board or an biomass. Fortunately, this quantity is disproportionately small compared to the generated power.

Social Impacts

The most adverse social impact of power generation is the displacement of people. The degradation of land and water resources also add to this impact. In comparison to the SSP, the land requirements of the alternative optionn are negligible, and the displacement problem is minimal.

CONCLUSIONS

The economics of the alternative energy options (excluding coal-based thermal power) are markedly superior to that of SSP. The achievable power potential is also many times the potential of SSP Finally the alternatives provide greater environmental and social compatibility and therefore greater societal acceptance. This is a very important bonus in favour of the alternatives apart from their lower financial cost.

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Kaiga left High and Dry

Ommissioning of the Kaiga Atomic Power Plant will be delayed because of a serious crisis in cooling water supply, according to the project authorities. The delay would be inevitable if the dam promised by the Karnataka government across the Kali river did not come up soon, they said.

"Non completion of the dam is the single major hurdle we are now facing," said Mr. Paramahamsa Tewari, Kaiga project director. He said the delay in commissioning of Kaiga would cause monetary loss of Rs 1 crore per day to the Nuclear Power Corporation (NPC).

The atomic power station requires several million gallons of water per hour for cooling and this water is supposed to be drawn from a reservoir created by the 36 meter tall dam to be built at Kagra, a few kilometres from the project site. The plant authorities said that the state-owned Karnataka Power Corporation Limited had agreed to complete the dam in June this year, but the construction work which was suspended ten months ago has not been resumed yet. "The water intake structure and the pump house at the project site are almost ready, but there is no sign of the dam coming up and we may face a crisis in cooling water," said Mr. V. Raghavan, chief construction engineer of the project.

He said that as a contingency measure, water from the river could be directly pumped to the reactors at the time of making the reactor critical. After that the plant will have to be shut down.

NPC officials said Kaiga site was selected because of assured availability of water from the Kali river hyde1 power scheme that envisaged construction of a series of dams in*eluding the one at Kagra.

Withdrawal of the World Bank aid for the scheme and an unresolved dispute between KPCL and its contractor over revision of rates are said to be the reasons for work stoppage at Kagra dam. Mr. Tewari said the NPC chairman has taken up the matter with the Karnataka authorities and hoped that the dam would be completed without further delay.

Meanwhile, workers yesterday (1st February, 1994) poured the last bucket of concrete on the dome of unit-1 of Kaiga signaling the completion of almost all the civil works of the first of six 235-mw reactors in the midst of a jungle, 35 km east of the scenic Karwar coast.

Mr. Tewarisaid subject to the availability of coohing water, unit-1 will be ready to deliver power from June 1996 and the second unit will be commissioned six months later.

"Soil investigations for two more reactors (unit-2 and 3) are already on," according to Mr. N. Rajasabai, station superintendent of the project who dismissed as "baseJess" reports that KAPP hud uprooted people and destroyed virgin forests. We cut 10,000 trees but have already planted 150,000 saplings elsewhere and the entire project required shifting of just 85 families," Mr. Rajasabai said. All the displaced families have been given houses in Karwar "and one member from each family has a job at KAPP," he said.

According to Mr. Tewari only 50 hectares of forest land had been used by the project so far, and another 70 hectares will be taken up when all the six reactors are built In contrast he said, the Kali river scheme for generation of 1400 MW "will submerge 100 times more forest area."

Mr. Tewari said environmental clearance for the four additional reactors had already been obtained and soil investigations were on. He said Rs 650 crore had so far been spent and the cost of the project was being revised upwards.

Mr. Tewari said Kaiga reactors are the first to have "a massive structural concrete wall" that acted as a third barrier against any leak and added to inherent safety. Power reactors elsewhere in India have only two concrete walls.

Newsreport in Times of India February 2, 1994

Editor's Note:

I found the most interesting part of the report to be the information about the nuclear authorities' willingness in case the dam is not built, to just make the reactor critical and then to shut it down. What this action would do is that it would ensure the bonuses for quick construction to engineers and construction workers, though the plant would not produce any electricity. It would also pollute the reactor irremediably. This contemplated action illustrates the 'patriotic' priorities of our nuclear establishment rather well.

Also I found Mr. Tewari's comment about the submergence caused by the dams to be very funny Here the man says just a second before that if the dam is not built the nuclear plant would have to be shut down, and yet he does not consider the submergence due to the dam to have any relation to the power plant Such blinkered vision is indeed characteristic of nucleocrats.

No.3

Environment Versus Development

Amulya K N Reddy

The debate between 'economic development' and environmental welibeing is being conducted in many parts of the world. It is of special relevance to the Third World. In the following, Professor Amulya Reddy puts the argument with special reference to India in the form of a dialogue between an Earth Protecting Mother (EPM) and a Growth Promoting Father (GPF). It has often been the contention of the nuclear lobby that while environmental considerations may be all right for the developed countries they are a luxury' for a poor nation, which is trying to 'catch-up with the West Dr Reddy shows not only how it is possible, but also why it is necessary to protect the Earth.

EPM: All over the world, the growth of energy use is leading to rapidly increasing environmental degradation. Local and regional habitat is being ruined by urban atmospheric pollution and acid rain. Accumulation of greenhouse gases in the atmosphere has raised the spectre of global warming and an uninhabitable earth.

QPF: Don't lay the blame for the increase in greenhouse gases on developing countries like India. This increase was caused predominantly by the industrialised countries through their voracious appetite for fossil fuels to generate electricity and run their vehicles. Even today, they contribute 58 per cent of the annual carbon dioxide emissions.

EPM: That is true, but even if the industrialised countries stabilise their emissions, India and other developing countries will-if they pursue present patterns of energy consumption-produce significant increases in concentration of greenhouse gases.

GPF: All this talk of global warming is only a tactic of the industrialised countries to divert us from our mission of development. The fact is that India is only a minor contributor to the global atmospheric changes—it accounts for only about *2.5* per cent of the total annual carbon dioxide emissions into the atmosphere. Acid rain is largely Western problem. Environmental degradation brought about by energy projects in India is negligible and not worth worrying about.

EPM: Not so! Our hydroelectric projects have been responsible for submergence of prime forests, the displacement of people from the submerged areas, their resettlement after deforestation in the catchment areas of reservoirs and the resulting soil erosion In Karnataka, for instances 42 per cent of the 203,913 hectares of prime forest lost between 1956 and 1984 has been due to power and irrigation projects. As for coal-mining, it devastates the countryside. Anyone who lives near coal-based thermal power plants knows the tremendous atmospheric pollution that they produce.

GPF: If there is to be progress, we cannot avoid the environmental consequences of energy consumption. After all, development requires economic growth which in turn depends upon the consumption of energy. India requires massive increases in the consumption of energy in order to promote development and ensure progress.

EPM: Do not equate development with growth (in the volume of goods and services). Whether socio-economic change is to be deemed as development or not depends upon what goods and services constitute growth and which sections of society benefit from these goods and services. Mere economic growth that does not result in the satisfaction of basic human mods (starting with the needs of the neediest!) is a mockcry of development.

GPF: But, you must admit that the standanl of living in a country depends upon its per capita enorgy consumption (PCEC). Peopic like you who oppose major increases in energy consumption are in fact preventing improvements in the standard of living.

EPM: Your view, which is indeed conventional "wisdom", is being challenged more and more because it treats energy as an end in itself. In fact, what people need its not kilowatt hours, tonnes of coal and barrels of oil but illumination, warmth, transportation, etc. Energy is only a means to the end of providing services, performing useful tasks and satisfying human needs. Hence, the true meaaure of development is the level of energy services (the amount of light, heat, motive power, etc) and the distribution of energy services (which determines who are the beneficiaries of energy). In order to advance development, the level of services must be increased and the poor must be the principal beneficiaries of energy supplies. For, it is this level of energy services that determines the quality of life and the distribution of services that reveals whether basic needs of the neediest, are being satisfied.

GPF: All that is obvious! The point is, how can the level of energy services be increased without increasing consumption of energy?

EPM: Energy services are provided by end-use devices (stoves, furnaces, lamps, motors, engines, etc.). The level of energy services depends, not only upon the magnitude of energy supplied to end-use devices, but also upon the efficiency with which the devices convert these inputs into useful energy. Hence, increases in the level of energy services can also be achieved with efficiency improvements. One gets twice the illumination with half the consumption of electricity by switching from one inefficient 60 watt incandescent bulb to two efficient 15 watt compact fluorescent lamps.

Are no further Increases In energy consumption necessary In India?

EPM: What is being suggested is that if opportunities for efficiency improvements are systematically identified and exploited, the magnitude of energy demand can come down very sharply. In that situation, energy supplies need not become a constraint on growth and many grandiose centralised energy supply projects become unnecessary. As Gandhi said: "The world has enough for every man's need, but not enough for everyone's greed!"

GPP: Even if energy conservation can achieve a great deal in the present context, India's growing population will compel rapid increases of supplies.

EPM: Supply increases can be minimised! It has been recently estimated that

1) even if India targeted for a level of energy services or activities corresponding to Western Europe in the 1970s (not that such a target is necessarily desirable!), and

2) if the country used for s.ll these activities the most energy-efficient technologies that nre commercial today or near commercialisation,

the Per Capita Energy Consumption would only have to be some three times greater than it was (including biomases energy) in 1978. Hence, efficiency improvements are the silver lining; they radically improve the prospects of achieving significantly higher standards of living: in the country. They may also lead to lower population growth rates since growth rates are generally reduced by improvements in the standard of living.

GPF: Your argument may well be valid for industrialised countries where the PCEC is so high that there is tremendous scope for energy conservation. But, the situation is totally different in a poor country like India where the PCEC is low and there *it* little room for energy conservation.

EPM: You are making the common mistake of confusing conservation with a decreased satisfaction of basic needs. The real thrust of conservation should be towards efficiency improvements. Energy is used very inefficiently in all sectors of the country's economy. Indian industry is largely based on energy-inefficient designs/equipment imported from the industrialised countries during the era of cheap energy. Thus, there are tremendous opportunities for energy efficiency improvements.

GPF: You are misleading us. In the late 1970s and early 1980s, the industrialised countries reduced their rate of growth of energy consumptibn by moving away from energy-intensive industries. But, our country cannot make these structural shifts because it has to industrialise. So, India can't reduce energy consumption in the same way as the industrialised countries.

EPM: Fortunately, India need not find it as difficult to modernise as the industrialised countries because its stocks of equipment are not as large. Hence, we can exploit more easily new technologies that permit dramatic improvements in industrial energy efficiencies. The industrial sector in India is an ideal environment for technological leap-frogging to an energy efficient future.

GPF: That may be, but what can be done about the biomass energy sources (fuelwood, agricultural residues and animal wastes) that account for a large fraction of energy consumption in India?

EPM: Most of this biomass is used in the residential sector for cooking in traditional ways at very low efficiencies. By moving to efficient sources/devices for cooking, the country can release enormous amounts of biomass to establish a major base for renewable energy sources (biogas, producer gas, ethanoi and methanol). Bioraasa-baeed devices such as gasifiers and gas turbines can then play a major role.

QPF: You admit that a given level of energy services can be achieved without changing the present stock of energy-utilising devices —however inefficient it may be—by increasing the input of energy. If so, why are you so much against increasing rate of growth of energy supplies?

The economic argument for reducing ratio of energy to GDP growth rates

EPM: There are powerful economic and environmental reasons for reducing as much as possible the ratio of the growth rate of energy to the growth rate of GDP. Current planning norms used by developing countries assume that the electricity growth rate should be about twice the growth rate of the GDP. To achieve such a growth rate in electricity supplies, astronomical investments are required.

The World Bank recently reported that the developing countries have asked for about $100 billion peryear to pursue current patterns of electricity generation and consumption when only about $20 billion would be available as aid. And India's Eighth Plan proposals demand an expenditure of about Rs. 100,000 crores to increase the electrical capacity by about 38,000 MW. Without* clear idea of where all this capital is going to come from, what is being proposed is absurd. It only proves that present patterns of energy generation and consumption are impossible to sustain from even an investment point of view.

Sustainability requires that the annual bill must be decreased by reducing the coupling between energy and GDP. We must lower the electricity-GDP ratio and get more GDP for lees energy. This can be achieved by efficiency improvements in energy production and consumption. The experience in many countries is that saving a unit of energy is one-third to one-half as cheap as generating it. Efficiency improvements also reduce the unit investment cost (Rs/kW) and the investment bill.

How will reducing the energy-GDP ratio help the environment?

EPM: The alarming increases in energy production and consumption are leading to environmental impacts that are quite serious. Many hydroelectric projects cause the submergence of forests as well as soil erosion in the catchment areas, and waterlogging and salinity increases in the downstream areas. And, coal-based thermal power plants are a major cause of atmospheric pollution.

GPF: You are presenting it as if there are no other supply options. But, there are clean energy sources. You must accept, for instance, that nuclear power does not lead to forest loss. It does not pollute the atmosphere with particulates and emissions that cause acid rain. It is non-polluting as far as carbon emissions and the greenhouse effect are concerned. In feet, it is the answer to both local environmental and global warming problems.

EPM: Don't forget the accident at Chernobyl that polluted vast areas of Europe. As long as we cannot conceive of all the ways in which reactor accidents can occur, we cannot rely solely on automatic safety mechanisms. And the moment we permit operator intervention, we cannot avoid some fool doing a foolish thing. Nuclear power is too unforgiving a technology.

GPF: Maybe the present generation of reactors are unsafe, but don't ignore the exciting developments that are taking place in nucl«>ar technology. Inherently safe reaetors are being designed and will soon be available.

EPM: But, reactor safety is only one of the problems with nuclear power-and in fact, not the main problem. Nuclear plants produce high-level waste which create long-term disposal problems that have not yet been solved. In addition, there is a very close link between nuclear power and nuclear weapons. This link to either direct through the use of power generation as a starting point for weapons production or indirect, through the theft of weapons-usable material. Nuclear power, therefore, is not the answer if we want to save the world, not only from environmental degradation and the potential dangers of global warming, but also from nuclear destruction.

In any case, using less energy is the best way of reducing the impact on the environment. Conservation technologies are the most environment friendly followed by decentralised technologies based on renewable sources of energy (mini- and micro-hydroelectric, btogss and producer gas, gas turbines, solar water heaters, etc. and in the near future, photovoltaic devices).

What must India do?

EPM: India must for economic and environmental reasons, adopt a new set of national priorities that are derived from the objective of need-oriented, environmentally sound and self-reliant development. This development focus determines how benefits

of energy are distributed between sections of society and the extent to which the quality of life of the poorest is improved. Energy planning must acquire an end-use orientation that emphasises energy services rather than energy consumption and take the opportunity for efficiency improvements through new energy technologies.

Whether it is new energy carriers or new end-use devices, there is a tremendous scope for basic research, technology development and innovation which means that Indian science, technology and management have to play a central role. In development oriented to basic needs, the stress has to be on the poor as beneficiaries—this means that scientists, technologists, managers and the people have to work jointly to build the new energy systems of the future. Such a development-focussed end-use-oriented (DEFENDUS) approach makes India's energy future a matter of choice; today this future is viewed as destiny because of present trends.

As a side-effect and a bonus, this approach will prevent the country's energy system from aggravating the global problem of greenhouse gases.

Hope for the new future

EPM: Thus far, the industrialised countries and the Indian elite have colluded in promoting a pattern of growth that is economically unviable, environmentally damaging and golbally disastrous and unsustainable. Now, the industrialised countries are realising that further promotion of these growth patterns can make the earth a veritable hell. Therefore, the industrialised countries might have a stake in sustainable development as a way of protecting the global atmosphere. This is the good news!

GPF: Sustainable development, with its emphasis on the needs of the neediest, may well lie in the interests of the Indian masses. But, it is not in the immediate interests of the lobbies associated with current energy patterns. These lobbies will put their own vested interests above the interests of their masses, of sustainable development and thereby the global climate. Thus,
it is very likely that there will be a head-on collision between the Indian elite and the industrialised countries. The elite will talk vehemently about the development versus golbal climate dilemma. And in this context, the resolution of the dilemmas through energy-efficicient futures will not be implemented. Instead, India will continue to be used for the promotion of economic growth and its wretched population will be condemned to adapting willy-nilly to environmental degradation. The custody of the country should remain in the hands of pragmatists who recognise this reality.

EPM: There will no doubt be tremendous opposition to the energy-efficient future that advances sustainable development. But, however difficult it may be to achieve such futures, the fact is that the present growth-obsessed trend is impossible to sustain on economic grounds. Custody of the country should be given to those who will ensure a sustainable future in which people will flourish!

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The Great Power Scam

Why Foreign Deals Must Be Scrapped

The government has embarked on a dangerous course in the vital electricity sector. Desperate to attract foreign investment, it is offering incentives and terms that are wholly iniquitous and do not even make commercial some. If these projects go through, India will soon have unaffordably expensive, gold-plated power, greatly increase its dependence on imports, cause a huge outflow of foreign exchange and destroy its own equipment-manufacturing sector, besides rendering many industries hopelessly uncompetitive.

If this sounds like an exaggeration, consider the following. The power ministry is about to clear 66 private proposals, including 36 foreign proposal, to invest Rs 88,000 crores in 28,000 Mw. of power (an addition of two-fifthe to the existing capacity) by offering a 16 par cent rate of return and a plant load factor

of 68.5 percent. The price to be paid will cover foreign exchange fluctuations and include guarantees on bilateral loans as well as payments by state electricity boards(SEBs).

Unheard of

Such terms are unheard of anywhere in the world. Typically, the projects in question have a capital cost of Rs 30,000 to 44,000 per kw. which is way above the Eight Plan working group norm of Ra 16,000 to Rs 20,000. They will generate electricity at more than double the present national average cost of Re 1.24 per kilowatt-hour. They also involve an adverse energy, material and foreign exchange balance.

The unseemly haste with which such "white elephant" projects are being pushed through by Union power ministry and some SEBe is exemplified by the manner in which the Central Electricity Authority was recently bullied into clearing five proposals, involving over Rs 13,000 crores, in a single day.

The government has bent over backwards to court foreign firms by offering rates and guarantees which it denies domestic industry; it has also waived debt-equity norms and raised depreciation rates and other terms to a point where the investment carries no risk whatever.

The starkest example of these ill-conceived projects is Enron's at Dabhoi in Maharashtra. This Rs 9,053 crore venture will generate 695 MW by burning imported distillates in the first phase (Rs 2,900 crores), and adding 1,320 MWand converting the whole capacity to liquefied natural gas, in the second. The capital cost works out to Rs 44,000 per kW, compared to under Rs 10,000 for two recently completed BHEL projects (Singrauli and Ghandrapura).

The price to be paid by MSEB to Enron is designated in US. currency in a bixarre form of globalisation: 7.47 cents or Rs 2.39 per kWh. An energy economist, Dr Kirit Parikh, **calculates after taking into account transmission and distribution losses and price escalation that industry will end up paying as much as Rs 4 per unit for Enron's power! This is four times higher than the average rate the Indian consumer pays, and will raise Maharashtra government's deficit to unconscionable levels.**

The whole proposal is so outrageous that even the World Bank has refused to finance it. Dr Parikh estimates that Enron will cause a foreign exchange outgo of between Rs 2,000 crores and Rs 9,000 crores. Besides, it will enforce continuing dependence on an expensive, foreign, petroleum-based resource. Another estimate shows that MSEB will lose Rs 2,000 crores on Enron deal even if it doubled its tariff. On the other four recently-approved projects, the loss at current tariffs would be Rs 4,500 crores.

Mind BotfUng

These are mind-boggling numbers by any standard. They simply spell ruin for the power sector and for Indian industry. Evidently what is involved here is padding of capital costs, an internal rate of return of 30 per cent, exaggeration of (fuel and material costs, and other ingredients of a gigantic scam.

These projects will also effectively destroy a number of Indian manufacturers of power generation and transmission equipment, themselves a major component of the critical capital goods sector. Contrary to propaganda, these are among the most competitve comapnies anywhere. They include BHEL, which World Bank regards as "one of the most efficient enterprises in the industrial sector," for which the effective protection rate Is close to cero" and whose products are on a "par with international standards".

BHEL has already been brought to its knees through systematic discrimination. It will perish if starved of orders. This is true of a number of Indian public and private enterprises as new projects are monopolised by foreign firms which face a domestic recession and have huge unused capacity.

Is there an alternative to such unaffbrdable and irrational power-purchase projects? There clearly is. Even on the extravagant assumption that the demand for power will annually grow at 6.5 per cent, that capacity will have to double in 12 years, and that the public sector will not be able to build more than 2.000 MW a year, it should still be possible to effectively create or save 50,000 MW. Mr R.D. Agha of Thermax Ltd. calculates that, by refurbishing, better maintenance and life extension of existing power plants; by cutting T & D losses by 10 per cent; by using co-generation; and by reducing sheer waste of power, India could save 47,000 MW.

No End to Irrationality

The irrationality does not end here. Once a precedent is set for a cost-plus, 16-per cent-return formula, foreign—and Indian — firms will demand similar terms in telecommunications, oil or fertiliser—with disastrous economic consequences.

So for as power goes, the government has created a scare by making wild demand projections and proceeding to court foreign investors on scandalous terms, with no consideration for the exchequer or for industry. The whole approach represents a retreat from the urgent task of reforming the electricity sector.

There must be more than a policy error here. Given the sheer magnitude of the deals being made, it would indeed be a miracle if no slush funds were involved. It is a fit case for a parliamentary investigation.

PrafulBidwai
The Time* of India December 29, 1993

Vested Interests Push Thailand Nukewards

India Offers Research Reactor

Energy Committee of the Thai Parliament expressed strong determination to push for nuclear power development in the country. The chairman of the committee, Rawi Kingkhamwong said that nuclear power was an option for the country. He lamhasted the House Committee on the Environment for its opposition to nuclear energy, calling the committee's information insufficient. "Many countries are very successful in developing nuclear energy. How come the committee on the environment chose to look at the countries that failed?"

Wiwat Plueksawan, assistant direct of Electricity Generating Authority of Thailand said that siting of Thailand's nuclear power plants would be finalised within this year and it would take two to three years before a decision on nuclear development would be made. From more than 100, the number of sites has already been narrowed down to five and it is quite certain that the power plants will be located in the southern part of Thailand, he said. The southern region has a high potential for nuclear power development as it lies close to the sea, which means ample water is available, he noted. Mr Wiwat said, however, that public acceptance was the most significant factor as to wheiher the country goes nuclear or not.

India has offered to export to Thailand a nuclear research reactor under the safeguard of the International Atomic Energy Agency.

Bangkok Pott
January 26,1994

| Letter Box

I was shocked reading news of nuclear cooperation between Thailand and India. The worst thing is that the nuclear center research reactor will be built at the place which is just 10 km. from where I work. They are now just under our noses.

Recently, one of the Canadian nuclear companies came to present their project to the Thai army. Nuclear companies know that soldiers will be their good supporters. They know that if any important decision needs to be made, the army is the next most influential force after the king. They understand us well enough.

We are now trying to raise a campaign against this reactor and also against nuclearisation of our country. We need to collect information on the issue. We dont know much about nukes. Only handful of people have a real understanding.

We would like to request that you send us books on the issue which you think would be useful for us. Please send us also information regarding the Indian use of nuclear power. Or, if you can write the articles on "Lesson from Indian Nuclear Power", it will be tranlated into Thai and then published.

We would also like to request other antinuclear groups to help us with information.

Eddie'

Subscription Information

Rs. 30/-per year (6 issues) within India
U.S. $ 15/-per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques, and drafts drawn on other banks, please add Rs 6/- Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumuktl
Sampoorna Krantl Vldyalaya
Vedchhi, $94 641 India

Please do not send personal checques or drafts addressed to Surendra Gadekar

Anumuktl Team:

Banaprava Naik, Sanghamitra and Surendra Gadekar

Publish} by S Gadekar tor Sampoorna Kranti Vidyalaya and printed at*
The Parijat Prlntry, Ahmedabad

PRINTED MATTER

BOOK POST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 7 Number 4 February / March 1994

Fairy Tales From Anuland

The Toddler And The Toy

Once upon a time, the Toddler had a toy. Toddler loved his toy. The toy made Toddler feel big and important. Allthough you could not taste it or see it or feel it or smell it but it glowed in the dark. You could play with the toy in many different ways. It gave you energy and if you zapped the boy next door with the toy he stayed zapped forever and ever. Yes, the toy was lovely.

Some people said the toy was useless. It was costly. It was dirty. It did not work more than half the time. It was carcinogenic and caused genetic deformities in children. And God forbid, if the toy was ever to blow up, heaven alone knew what damage it would do. It was no toy for a small boy or for anybody else for that matter. Such toys should be banned these people said.

But Toddler knew that all these people were just jealous of Toddler's wonderful toy. Any way these old fogies lived in a world of their own far away from Anuland. And they talked nonsense all the time. Like one should love one's neighbour. Ha! Toddler hated his neighbour Never mind they were brothers once. That was long a go. This upstart kid next door was quarreling with Toddler about the ownership of the swing. Everybody knew that the swing was an inalienable part of the Toddler home and no power on Earth could remove it. But that sneaky creep next door was up to all sorts of tricks. He was secretly making a toy of his own. And he kept shouting that if

Toddler did not give him the swing, he would zap Toddler.

The toy gave you power. Everybody respected you. All the big boys had toys of their own. In fact, unless you had the toy, you were nobody. Even the infants wouldn't look at you with respect. And Toddler wasn't small anymore. He may be poor but he was big. Being poor was terrible. You had to beg for toffees from Big Brother and the other big boys who lived on the West side. But as far as the toy was concerned, Toddler was self-reliant. Nobody could bully him.

Big Brother had made the first toy And then the second toy And the third. And .... He had made them bigger and smaller and safer and deadlier. He had built so many of them that now the whole house was full of toys. In fact, the whole of Anuland was full of toys and there was no place left where you could forget about toys and play in peace. Making toys was not easy It required brains and yellowcake. Yellowcake made everything yellow, and you couldn't clean the stuff. His whole house had 43,300 spots of yellow. But what could he have done? There was that evil red bully (of course they were buddies now and the red bully was not such a bad guy once you knew him especially when he came begging on his knees for a toffee to Big Brother—no, not a bad chap at all).

But in the old days if Big Brother hadn't built all his toys and stayed a stepabead of Red... But all that was old history now.

Big Brother was worried. All these pesky little jerks with toys. They would surely blow up one day. And if the toy were ever to fall in the wrong hands ... Well, they had all made the deal. He had got everybody to agree that only he and the rest of his gang would be allowed to zap with the toy. Everybody else could play with the toy but they had to promise, a real cross your heart and be allowed to die promise mind you, that they would never ever try to use the toy for zapping. If they promised and behaved properly and traded all their toffees for the toy, then Big Brother or somebody else from the gang would make a toy for you and teach you how to play with it and even build one for youself. But if you ever tried to break the promise, remember the runt. The runt lived in the middle of the street. He had remised but had been double-crossing them and was secretly building a toy for zapping. Well Big Brother had shown him. 'Let that be a lesson to youall. Anybody who falls out of line better watch out. Big Brother is watching you.

The trouble was, that Toddler and the upstart kid next door had not agreed to the deal. They had their toys and kept threatening each other with zappping. Three time during the last ten years, Big Brother had had to step in and break up the fight. The last time it had been quite touch and go. If Toddler wasn't put in his place then what about the others. Nobody would listen to Big Brother any more.

Sleep well, my princess, I will read you the rest of the story tommorow. You have nothing to worry. Anuland is far away and this is a fairy tale. If only real life were so simple.

Surendra Gadekar

from the Editor's 'Desk

AERB Chief Visits Vedchhi

Relations between antinuclear groups and the nuclear establishment in India over the past many years have been cold, even frigid. This is in sharp contrast to colonial times when the intercourse between nationalist groups and the British rulers though hostile and confrontational was also marked at times with mutual personal admiration and even friendship. Nucleocrats in India have thought of antinuclear activists, if they thought at all, either as well meaning but hopelessly deluded and irrelevant Gandhian cranks, or as foreign inspired and funded busybodies who were a hinderance to the task of 'nation building'. Antinuclear activists have reciprocated this contempt and have thought of nucleocrats as self-serving sycophants with no compassion for the people. It is a situation where there can be no dialogue.

The few occasions where the two have come face to face have been public platforms most notably the "National Workshop on Nuclear Energy" in Bangalore in December, 1988. At these events, both sides have tried to put their point of view across to the public but have not tried to build bridges towards each other. The upshot of these debates has been that the nuclear establishment has realised that they are on a very sticky wicket in open public debate and has avoided such fora ever since. They have instead, with some success attempted to influence public opinion by trying to 'buy-off opinion makers around nuclear power plants. Also, they have bombarded TV, radio and large circulation print media with 'documentaries' and paid advertising.

Dr A Gopalakrishnan, the chairman of the Atomic Energy Regulatory Board, has taken initiative in trying to break the ice. He met Professor Dhirendra Sharma in January and visited us at Vedchhi in February. Unlike the previous occupants of his chair, who came determined to 'allay our fears', he came alone and spoke with refreshing candour. He wanted to understand the Rawatbhata survey and asked many questions regarding that. He proposed arranging periodic (once every three to four months) meetings with antinuclear activists and 'knowledgeable' journalists, so that "various issues can be discussed across a table and a mutual understanding can be built."

Compared to the sterile stalemate of the past few years, this position does offer some interesting possibilities. It is also fraught with the danger of co-option. Entry to previously inaccessible information and dialogue can if one is not careful lead to 'self-censorship' and a muting of criticism. Also, these across the table discussions cannot be a substitute for open public debate which are the most effective means of educating the public on nuclear issues. Therefore, I would like to hear what you, dear reader, have to say on the issue and invite your opinion regarding the basis on which we should proceed. This would help in another way: I will, for a change, have some letters to publish in the letter-box.

I must humbly apologise for the disaster of the October / November '93 issue where due to an incompatibility between the fonts used in my computer and the printer's, the formating had gone haywire.

Disposable Citizens

"A new nation conceived in liberty
and dedicated to the ideal that all men are created equal"

The door to a secret chamber of nuclear horrors is slowly being prised open in the United States, revealing government-ordered radiation experiments on retarded children, pregnant women, and convicts and a range of other clandestine atom-age projects which have shocked and frightened the American public.

The steady drip of newly released records from the department of energy, the agency which has overseen America's military and civilian nuclear complex since the dawn of the nuclear era, has suddenly turned into a torrent. Collectively, the records conjure up a nightmarish picture. They show how successive administrations, determined at all costs to keep ahead of the Soviet Union in the nuclear arms race, repeatedly and illegally placed thousands of unsuspecting Americans at serious and lasting physical risk.

The government's human experiments, undisclosed atomic weapons tests and deliberate radiation releases over populated areas began in 1945 after the atomic strike on Japan in August of that year. In some cases they have continued almost until the present day. They remained hidden for so long because of what Hazel O'Leary, President Clinton's new energy secretary calls a culture of deception.

"We were shrouded in an atmosphere of secrecy," Ms O'Leary said recently "I would take it a step further. I would call it repression."

Having taken control of the Energy Department early last year Ms O'Leary has been clearly shocked by what she found in its archives. In an unprecedented move, she ordered the review of an estimated 32 million secret documents for possible declassification. Many have already been released. She also ordered a sweeping investigation into the radiation experiments on humans. Then Ms O'Leary took another extraordinary step for a senior government official. She said compensation for victims of the atom age programmes would have to be considered.

"My view is that we must proceed with disclosing these facts and information regardless of the fact of whether it opens the door for a lawsuit against the government. We ought to go forward and explain to the Congress what has happened and let Congress and the American public determine what would be appropriate compensation," Ms O'Leary said. For America's defense establishment, it is as if a whistle blower has suddenly become the boss.

So far, the department of energy records and related research by congressional and journalistic investigators have brought the following US government projects to light:

- **At least 19 mentally retarded boys were fed radioactive milk mixed with cereal in experiments conducted by scientists from Harvard and the**

"We were shrouded in an atmosphere of secrecy. I would call it a culture of deception. My view is that we must proceed with disclosing these facts regardless of the fact of whether it opens the door for a lawsuit against the government. We ought to go forward and explain to the Congress what has happened and let the American public determine what would be appropriate compensation,"

Ms. Hazel O'Leary
U.S. Energy Secretary

Massachusetts Institute of Technology in the 1940s and 1950s. The experiments, funded by the Atomic Energy Commission, were not fully explained to the boy's parents. They were told, in a letter that, we are considering the selection of a group of our brighter patients, including your son, to receive a special diet. The boys were told they were participating in a science club.

- About 800 pregnant women were dosed with radioactive iron in a government -backed experiment at Vanderbuilt university in Tennessee in the late 1940s. The objective was to study the effect of radioactivity on fetal development. A follow-up study found a higher than normal cancer rate among the women's children.
- In experiments conducted in jails in Oregon and Washington states, the testicles of more than 130 male inmates were exposed to high levels of radiation from X-ray machines. The prisoners were paid for their trouble, but according to Robert Alvarez, a senior aide to Ms O'Leary, the risks were not fully explained to them. "These prisoner studies were clearly unethical," Mr. Alvarez said. The experiments continued until the early 1970s. There have been no follow-up studies since the prisoners were released.
- Eighteen patients with apparently dangerous illnesses were injected with high concentrations of plutonium at laboratories managed by Chicago and two other universities in experiments between 1945 to 1947. The injections were apparently made without the patients' informed consent. Similar experiments using injections of radioactive calcium were conducted on terminally ill cancer patients in New York. The purpose was to measure the rate at which radioactive substances are absorbed by human tissue. At the University of Rochester, six people with healthy kidneys were given uranium injections to conduct research on what caused kidney damage.

Greg Herken and James David, both researchers at the Smithsonian's National Air and Space Museum, have recounted the history of two doctors at the University of California Hospital at San Fransisco— Joseph G Hamilton, a neurologist and Robert S Stone, a radiologist. One of the aims of their human experiments was to use radioactivity as a weapon. As early as the spring of 1943, they discussed with the Army killing an unspecified number of enemy civilians by poisoning food or water with radioactive strontium. Dr. Hamilton started experimenting on a house painter believed to be suffering from terminal stomach cancer by injecting him with "many times the so-called lethal textbook dose" of plutonium. The patient was never told what he had been injected and the poor man dutifully collected his urine and faeces in glass bottles so that the good doctor could monitor the plutonium excretion from his body. A biopsy later showed that the patient suffered not from stomach cancer but from an ulcer! Dr. Hamilton, however, went on to inject plutonium into a boy with bone cancer and later into a black railroad worker also with bone cancer. Dr. Hamilton sent a secret note to the US Army in which he proposed using radioactive smoke as a killing agent. Such a type of preparation would appear well adapted for producing fission product aerosols to subject urban populations to fission product poisoning by inhalation. In October 1949, under his persuasion, the US Army conducted first of six experiments on radioactive aerosol idea in Utah.

Dr. Stone, the radiologist, was giving whole-body X-rays to arthritis patients and even the Atomic Energy Commission was alarmed by what he was doing. Herken and David say that the AEC experts wrote to him that they "do not wish to collaborate in clinical investigations with physicians in whose considered judgment they do not have any confidence." But Dr. Stone apparently continued his experiments, funded by the University of California, at an old-people's home in San Francisco.

Government scientists deliberately exploded atomic bombs in the atmosphere over the US in order to examine the spread and effects of radioactive fallout. The report identified 12 such tests, including one in 1950 in New Mexico after which radiation particle levels were carefully measured in the town of Walrous, 70 Miles away. At the time, scientists said

SPACE AGE RESEARCH

Astronauts in space encounter a great deal of cosmic radiation which can impair their motor ability. To test the effects of high radiation fields on muscular capability, mentally retarded children were made to draw pictures of simple objects like circles and triangles in a room, with a controllable caesium source.The radiation from the source was slowly raised till the children were unable to draw coherent shapes.

II

there was no risk to people, even though their purpose was to develop a weapon that would kill enemy soldiers through radioactive fallout.

In fact, according to the Los Alamos national laboratory, nerve centre of America's nuclear weapons research, there were about 250 experiments in which radiation was deliberately released into the atmosphere between 1944 and 1961, in New Mexico, Nevada, Utah, Washington state, and perhaps elsewhere,

"Releasing these amounts of radiation on people in an area in secret is a little hard to swallow," said Senator John Glenn, the former astronaut, who is pushing for the release of other government departments' records, including those of the Pentagon.

All of this has come on top of Ms O'Leary's announcement on December 8,1993 that the government conducted 204 previously undisclosed underground nuclear tests in the US between 1963 and 1990. Among this total are 18 unannounced tests undertaken during the Reagan and Bush administrations. Independent experts said they were at a loss to explain exactly what these later tests were for, or why they were kept secret.

Ms O'Leary said that between 600 and 800 people were subjected to government radiation experiments; she has set up a public telephone inquiry service called the Human Experimentation Hotline. On its first day in operation the hotline was swamped with calls from worried families.

The number of Americans intentionally exposed to radioactive atom test fallout, and its lasting after-effects is unknown. But a study of high fall-out downwind areas in Utah, for example, has found childhood leukaemia rates which are 2.5 times the national average.

Much of the macabre 'evidence' of human experimentation has been preserved. About 20,000 irradiated pieces of people are kept at a national human tissue depository in Spokane in Washington state.

Environmentalists and others say that Ms O'Leary and her staff—some of whom were formerly active opponents of the energy department and the nuclear establishment—have opened a Pandora' s Box.

The scale of the problem is staggering. A report by the federal environmental protection agency estimated recently that more than 43,300 military and industrial sites in the US are or may be contaminated by radioactivity.

Ms O'Leary says that by opening the files she hopes to set an example for other nuclear powers and to improve the department of energy's public image as it begins its domestic post Soviet nuclear clean-up. But most of all, she said recently, she wants the truth to come? out. When she learned of the human experiment* she was "appalled and shocked and it just gave me an ache in my gut and in my heart/' Ms O'Leary said.

Chilling too was the publication this week of a 1950 memorandum to senior atomic energy commission officials written by the very same Dr. Joseph Hamilton. It warnced that human experimentation was probably unethical, possibly illegal and perhaps a breach of the Nuremberg Code of 1947. If the information became public, Dr. Hamilton said, there would be a lot of criticism "as admittedly this would have a little of the Buchenwald touch."

Based on nports by Simon Tisdall in The Guardian (December 30, 1993) and Bharat Bhushan tn The Indian Express (January 30, 1994).

> *"Subjecting urban populations to radioactive aerosol poisoning by inhalation would appear to be a good killing agent. Human experimentation is probably unethical, possibly illegal and perhaps a breach of the Nuremberg Code* ***ofl94\. If the*** *information were to become public, there would be a lot of criticism as admittedly this would have a little of the Buchenwald touch."*
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> ***Dr. Joseph G Hamilton Neurologist, University of California (1960)***

WE ARE ALL GUINEA PIGS

The Department Of Energy's recent revelations about the testing of plutonium and other radioactive substances on uninformed people are at once chilling and liberating. Chilling because it is nearly impossible to believe that our own government could have acted so cynically and so contrary to any meaningful standard of ethical behavior. Liberating because exposing the truth is the first step toward correcting and redressing the reality

Energy Secretary Hazel O'Leary must be applauded not only for taking 40 years of cold war secrets and splashing them across the front pages of every newspaper in the U.S., but for directly attacking the good old boy network of the Clinton Administration and demanding compensation for radiation victims before the network could move to hush up the government's liability

It was a gutsy move, and we appreciate it. We understand that in Clinton's inner circles, O'Leary and EPA administrator Carol Browner are sometimes dismissively referred to as the "sob sisters." From where we sit—and we disagree with both often—they may be the only Clinton administration appointees with any backbone. Consider that O'Leary virtually single-handedly took on former Defense Secretary Les Aspin, the Joints Chief of Staff, and the rest of the military-industrial complex (yes, it still exists), and successfully fought for an end to nuclear weapons testing, on the simple grounds that the U.S. has no technical orscientific reason to conduct still more weapons tests. And to underscore the point, O'Leary released documentation proving that the U.S. had conducted at least one-third of its nuclear weapons tests in secret—as recently as 1990. It was a warning to the Pentagon and its supporters that there won't be any more secret weapons tests.

But O'Leary's welcome revelations that the government, and its all-too-willing partners in the medical community, conducted highly unethical radiation tests on civilian subjects only underscores a point that must not be overlooked: we are all guinea pigs.

Simply put, is there any ethical difference between deliberately exposing uninformed Americans to plutonium by injection or by deliberately releasing Iodine from Hanford or by exposing them to a myriad of elements through air anjl water from radioactive waste dumps? We think not.

The "medicaT'experiments, conducted with a "touch of Buchenwald" as they were deemed by one scientist, at least were limited. The experiment of "disposing" of radioactive waste in unlined trenches in the California desert, for example, could affect millions of Americans.

Enough scientific evidence has been accumulated to indicate that putting lethal radioactive reactor parts— and that's what "low-level" radioactive waste is —into the proposed Ward Valley dump is tantamount to signing a death warrant to Los Angeles, the most water-starved metropolitan area in the nation. The waste will leak, and it will enter the water supply. And all of southern California will become guinea pigs.

Exposing the truth is just the first step toward correcting am redressing the reality Even while reaching out to those who wen deliberately exposed t bizarre radiation experiments, we must recognise that we have all been exposed to unnecessary radiation from the nuclear experiment. We deserve closed reactors, not leaking waste dumps. We deserve a full re-evaluation of our policies, not a rehash of existing, inadequat laws. The nuclear industry cannot be allowed to generate more waste and radiation.

And so it goes for every other proposed "low—level" radioactive waste dump. In every case, there is a basic conflict between the hazardous lifetime of the waste (tens of thousands of years) and the institutional control periods established by law for the waste (100-500 years). And by the hazard posed by "low-level" reactor internals and the technology which doesn't yet exist to contain the radioactivity The reality and the laws don't mesh, and thus we have a grand experiment, one in which the American people will again be the losers.

A similar argument could, and must, be made for high-level waste, as it could for the routine operation of reactors, which must release radiation into the environment merely to operate.

The fact is, every few years the government and relevant scientific bodies must reduce their "acceptable" levels of radiation exposure as new evidence indicates there is no "safe" level of radiation exposure. And if there is no safe level of exposure, it is incumbent upon the government to eliminate public radiation exposure.

This the government will not do, and thus we are back into experimentation upon an uninformed and unconsenting public. As we learned from Nazi Germany, the Big Lie is always more effective than the small one. It is one thing to consider individual abuses; it is quite another to consider abuses on a mass level.

From Oak Ridge, to Han ford, to Three Mile Island, to Dresden, to Seabrook, to Ward Valley West Valley, and Yucca Mountain, experimentation upon uninformed and unconsenting people is wrong, and the nuclear era is nothing if not one grand experiment.

Even while reaching out to those who were deliberately exposed to bizarre radiation experiments at the height of the Cold War, we must recognise that we have all been exposed to unnecessary radiation from the nuclear experiment.

But how do we move from understanding the immorality of uninformed "medical" experimentation to halting the equally unethical but continuing nuclear age?

Yes, the waste and radioactivity must eventually be somewhere, and yes, the antinukes are willing to play a responsible role in ultimately devising a solution as acceptable as possible. But not under the existing, unethical, and failed laws and schemes, and not—as the debate is driven today-to merely allow the nuclear industry to generate more waste and radiation.

We work every day to make our elected officials, and the public as well, understand what the nuclear era really means, and why it needs to be dismantled as soon as possible. We try to help people understand the unique hazards posed by both the power and the longevity of radiation and radioactive waste. Maybe we don't work hard enough, that's certainly possible. But we also need your help. If the continued experimentation upon the American people distresses you as much as it does us, then contact your elected officials and demand an end to the nuclear age. We deserve closed reactors, not leaking waste dump*. We deserve a full re-evaluation of our policies, not a rehash of existing, inadequate laws.

And we deserve an ethical underpinning that says: no more nuclear experimentation on our citizens. We've had enough!

The nuclear era is nearly over. What we are seeing is the last twitch from the dinosaurs tail. Hut it* a large, powerful dinosaur that can be quite destructive unless tamed. We must all act, as directly and aggres. sively and joyously as possible, to ensure that the horrors so recently revealed are not simply prelude to far greater horrors to come. Our children will have other battles to fight; let this one be ours.

Michdel Mariottc, The Nuclear Monitor January 12, 1994

Deadly, even while dead

Count Dracula, it is said, rises from the dead to suck blood from the living. Shutdown nuclear plants can also rise from the dead and are far more dangerous.

According to US Nuclear Regulatory Commission (NRC), cold weather caused breaks in the service water system for Dresden-1 reactor in late January, resulting in a spill of some 55,000 gallons of contaminated water to the containment. The reactor has been shut down since October 1978. But according to an NRC report, it appears that only sheer luck averted a far greater catastrophe: an inspection found that the plant's irradiated fuel pool was vulnerable to the same type of weather-induced cracking. Within 40 minutes of such a crack, the fuel pool could have been uncovered. Consequences, says the NRC, would have been phenomenal dose rates at the pool of 2,700 rems an hour (a dose of 400 rems kills half the people who are unlucky enough to receive it immediately) and 19 rems/hour within 100 yards of the pool (which, the report dryly notes, is where the NRC resident inspector situ).

The Nuclear Monitor
February 28, 1994

Guinea Pigs, Guinea Pigs Everywhere

It is natural for Americans to be shocked at the revelations that grievous harm and injury was deliberately caused to many ordinary American citizens by their own government. All of us tend to look upon 'our own' government as protector and guarantor of citizen's rights and to find instead that the protector himself is the violator, is a blow. The blow is greater because the government has been preaching 'concern for human rights and dignity' to all and sundry.

While I fully endorse the sentiments expressed in the "We are all guinea pigs" editorial of The Nuclear Monitor, and that is why we have republished it, there is something in the tone that I don't like. There is too much emphasis on "Americans". Experimentation without consent on uninformed beings is wrong whether they be Americans or Polynesians or Japanese, or any other racial or ethnic group. The US government during the war and later during the cold war did willfully cause radiation harm and injury to peaceful citizens of other countries as well as its own citizens.

The dropping of the A-bomb on Hiroshima and Nagasaki, was actually more in the nature of an 'experiment'. But there have been many other subsequent assays as well. The whole sorry saga of bomb testing has involved experimentation on a vast scale. This has been mainly done on populations in the Pacific and in the Nevada desert.

But American government is not alone in indulging in this criminal activity. All nuclear powers have been equally unmindful of human rights of weak and voiceless citizens. The Soviets in Kazhakhstan or in the Arctic, the French in Algeria and in the Pacific Islands, the British in Australia or the Chinese in Mongolia and in Tibet have not hesitated in sacrificing the health of innocent populations in the pursuit of nuclear 'power'. Even the one and only 'peaceful' nuclear power exploded its 'device' in the deserts of Rajasthan. There have been studies by doctors at the university of Jaipur showing increased incidence of cancers in the local population.

The revelations are shocking for another reason as well. They show the widespread involvement of 'respected' researches in prestigious universities and research institutions. Even those who are not dismayed by the dark deeds of governments, are apt to be aghast at this involvement, since it goes against much cherished notions about scientific humanism and integrity

The widespread involvement of scientists at many different universities, makes it all the more astonishing that it took more than 40 years for the facts to come out in a society which prides itself on being free and where the press is known to be so active and outspoken. This conspiracy of silence has involved many, perhaps thousands. The 'experiments' could not have been conducted without the willing cooperation of research assistants and lab technicians and office administrators and the whole paraphernalia that constitutes 'modern' research. That none of these tried (or succeeded if they tried) to penetrate the dark veil of secrecy, is a telling illustration of enormous dead weight the System' has. All of us, you and I, are afraid of making a 'scene' and it is this apathy which allows the grossest crimes.

It is in this context, that these revelations of American misdeeds are of importance to us in India today. For one thing, Indian nucleocrats have learnt not only nuclear technology in American nuclear establishments but they have also imbibed the prevailing 'culture'. The practice of hiring large numbers of poor, untrained 'casual' workers at nuclear power plants so that the individual doses of the regular staff are reduced, is an old American custom which has been fervently followed in Indian nuclear establishments. No monitoring of the health of these workers is being done. This is worse than experimentation, since although the authorities are damaging the health of these poor people, they do not bother to even record the 'experiment'. The conspiracy of silence is no less deafening in India. Reports regarding deformities and ill-health at Rawatbhata and Jaduguda have come many times in the press and yet the victims have still not received government attention.

"Internationally accepted norms" form a powerful shield to cover wrongdoing everywhere. This magic mantra is invoked by Indian nucleocrats as the last word to stifle any protest. (For example, see the article "AERB Chief admits nuclear workers exposed to high radiation levels" in this issue.) Although individual exposures in India may (and it is a big may), be within internationally accepted limits, these limits themselves are certainly not safe and have been revised downwards frequently in the past. It is also ironical that a number of experts in the field of radiation have obtained their expertise through precisely such ethically dubious experimentation. It is the opinions or such 'experts' which has been accepted by the judges in a large number of radiation injury cases.

We are all guinea pigs but even guinea pigs should have rights and it is only when we are ready to stand up for guinea pigs that we have a moral claim to stand up for our rights.

Surendra Gadekar

Nuclear Inspector Sues Industry

Says Leukaemia Caused By Radiation At Work

A former US Nuclear Regulatory Commission resident inspector at Southern California Edison's San Onofre nuclear complex is suing the utility, its partner—San Diego Gas & Electric, Westinghouse, Combustion Engineering and Bechtel Corporation on the grounds that her work at the plant resulted in radiation exposures that caused her to contract acute myelogenous leukaemia.

44-year old Ruth Tang, who has been told by her doctors that she has about six months to live, is at the center of a lawsuit that could shake the nuclear power industry to its foundations.

Tang alleges that her cancer was caused by radiation exposure from her work at San Onofre. Especially during 1985-87, the plant was plagued by defective fuel rods and radioactive "fleas," highly radioactive but microscopic particles which cling to workers' clothes and skin. Her suit charges that standard dosimeters used in the nuclear industry do not accurately measure such exposures, and thus there is no way of knowing how much radiation she actually received while working at the plant.

And the suit brings up even larger issues. For example, if radioactive "fleas" cannot be detected by the industry, then how many have been set loose in communities across the nation and the world? And the suit also challenges the notion that there is any safe radiation dose.

Said Tang's attorney, Don Howarth, "If we're successful, we will crack open for the first time the liability of these nuclear power plants for what they"ve been doing to their workers and the communities outside."

The utilities attempted to have the case dismissed before trial, but a federal judge ruled that the case involves complex matters of fedoral and state law, and would be heard. The trial began in early January.

Tang is supported by Dr. Edward Radford of the University of Pittsburgh, Dr. Harry Demopoulos of New York University, and by F. Morgan Cox, a health physicist. All argue that industry dosimeters are inaccurate. In an affidavit, for example, Cox said, "these devices register external dose only and do not take into account any internal radiation dose. Second, these dosimeters do not detect or record alpha radiation, except in rare instances of actual contact with the radiation source. Third, they will detect and record beta radiation to a limited extent, and only if such radiation is in close proximity to the dosimeter **and is** not shielded. In addition, TLD's do not detect or record low energy gamma radiation or gamma radiation from sources too far from the device."

Mistrial Declared

A mistrial was declared February 9 in the case of Ruth Tang. According to CNN, the jury was deadlocked at 7-2 in tang's favour. A retrial has been set to begin March 1, 1994 although CNN reported that Southern California Edison and the other defendants in the case might now offer Tang an out of court settlement.

According to Tang's dosimeters, she received a total of 34 millirems during the period June 1985 to December 1986. But contradictory readings, and internal utility documents which revealed both the presence of the radioactive "fleas," and utility concern over the inadequacy of the dosimeters, persuaded the scientists that her actual dose may have been far higher.

And if her dose were higher, there is little reason to believe other workers' doses were not higher as well. Further, because the "fleas" cannot be easily detected, they may have spread throughout local communities on workers' clothes and skin.

The utilities also argued that they should not have to face liability because their releases were within regulatory limits and because the Price Anderson Act limits their liability But the court rejected both arguments. Normally, civil suits such as this take years to resolve. But Federal Judge Gordon Thompson Jr. accelerated the trial when he learned of Tang's limited life expectancy.

Tang, who has a master's degree in nuclear engineering from MIT, told the Los *Angeles Times* that she is filing suit to provide money for her daughter, who is also studying at MIT. Originally, her daughter wanted to study nuclear engineering, but Tang talked her out of it. "I didn't want to do it," Tang told the *Times,* but I didn't think it was safe."

The Nuclear Monitor
January 17 and February 14,f 1994

The Answer, My Friend, is Blowing in the Wind

Portland General Electric (PGE), which closed its Trojan reactor early last year, has decided that wind power will play a major role in its future. The utility announced December 28, 1993 that it has selected a bid for a 100 M W wind plant, which is scheduled to be operational by 1996. PGE also selected 21.1 MW of geothermal energy proposals, 32 MWofbiomass,and 16 MWof hydro. According to a PGE spokesman, the utility intends to quadruple its wind commitment by 2002, and could quadruple it again by 2012.

The answer also lies in White Paint

Ask energy—efficiency expert Art Rosenfield what Los Angeles needs to keep cool in those long hot summers and he'd most likely say a can of white paint.

In a recent study he conducted at the Centre for Buidling Sciences at Lawrence Berkeley Laboratory in California, he and his researchers whitewashed the roof of a house in Sacramento and found the house used 40 percent less cooling energy in summer. If this is were applied to the whole of the United States, which uses 10 percent of its electricity on summer air conditioning, the potential energy savings would be enormous.

Art says he was inspired by Mediterranean countries where not only roofs, but walls and roads are whitewashed. Indeed, in Israel, urban residents are required by law to annually paint their roofs white.

He believes whitewashing would significantly curb the solar radiation absorbed by dark rooftops and asphalt in cities like Los Angeles. Raising that city's albedo (the percentage of solar radiation reflected rather than absorbed) from 0.15 to 0.25, would reduce the "heat is land" effect and lower the city's summer temperature by 5-8 degrees Fahrenheit, and save about two giga watts of energy during peak air conditioning use. In financial terms, this would save the Angelenos a cool $700 million a year.

And also in hog shit at the farm

After American pig farmer Roy Sharp built a lagoon to treat the wastes from his 16,000 hogs and covered it with a tent to control odours, he wondered if he could burn the trapped methane gases to produce electricity. Engineers told him it would never be cost-effective, because such a system couldn't produce more than 26 kilowatts(kW) of electricity an hour. Roy went ahead and built his lagoon anyway. "We're now getting 140kW ar\ hour during the summer," he says. "What we're doing here is confounding the experts." The pig gas power plant produces enough energy to cover the farm's monthly $3900 electricity bill. Meanwhile, Roy receives $400-900 a month from the local power company for the excess electricity he's pumping into the local grid. And the lagoon system is now been considered by Russia, China and eastern Europe.

But the answer certainly does not lie in accepting Dutch Bull-Shit

India, the land of phoren goods, from mineral water, aerated drinks, chewing gum, Kentukky Fried Chicken, ... is about to become the world repository of cowdungand hog droppings. Dutch farmers along with other European farmers have been stuffing their farm animals with all kinds of chemicals and drugs. Thus, the dung is full of these poisons and poses a serious danger to people. Chemials from cattledung are one of the major cause of groundwater pollution in Holland. European environmental regulations do not allow the dumping into the seas. Till now the 'solution' had been to dump these wastes in Africa, but now environmental protest there has persuaded the Dutch government to view Manmohan Singh's new India with 'favour.'

Seaswan B.V., a company based in Wassenaar and EID Parry of Madras have formed a joint venture. The project envisages importing seven to ten million tons of dung eveiy year. Prior to traasportation to India, biogas will be extracted from'the manure. Then it would be loaded into large tankers and set sail for Kandla. After drying in various locations in Gujarat, the material would be sold as 'Envirodung' in Indian markets. The investment in India to import this shit is estimated to be US $150 million. It will create 150 jobs for the natives.

The project document states, "India has a fertiliser market of 26 million tons a year. India is in the process of decontrolling its feriliser prices. As a consequence, older and inefficient fertiliser units will shut down. The market will for sometime stabilise at a lower volume and with higher prices. This situation opens up a strategic advantage for the Indian Environdung joint venture." Holy Cow!

Based on reports in The Nuclear Monitor (US), Third Opinion (Australia) and an Action Alert issued by Public Interest Research Group Delhi.

The Foreign Connection

"The truth is, more people are making a living by talking about radiation induced diseases than dying of them. It has become fashionable to talk of radiation as the inducer of cancer and genetic abnormalities although research and studies conducted worldwide have proved otherwise."

A *N. Prasad*
Director,
Bhabha Atomic Research Centre

hW ad has said unny if the truth were not so sad. Anybody who is a victim of an environmental polluting agent has a horrid existence. First, there is the suffering induced by the disease itself. On top of that you have to constantly fight an uncaring system which tries to blame the victim for the disability.

However, there is one point on which I agree with Dr. Prasad. I dearly wish the situation he describes actually becomes reality. It is only when many more people than just those 'affected' would talk about radiation induced diseases and take up the struggle, that we would be able to put an end to this madness.

Dr. Prasad is the head of the only institution allowed to do research on nuclear energy in the country and I cannot believe he could be as ignorant as his words imply. If he were just to read the first page of any standard textbook on radiation biology, he would know that radiation has been well established as a causative agent in many different types of cancers in both human and animal studies conducted in all parts of the world since many decades.

The BARC chief made this assertion while denouncing a TV programme on CBS network. On Sunday, February 13, 1994, a programme entitled '60 minutes" had carried a feature on the Indian nuclear programme. Since I have not seen the show, I cannot comment on the contents. However, I wonder if the heads of atomic research centres like the one at Harwell in England or Argonne near Chicago in the US ever feel constrained to make comments about a TV programme broadcast on the Doordarshan? The guys at BARC obviously do, though not about programmes on Doordarshan (their pocket network) but on •phoren' TV networks and whenever they do open their mouths they invariably remind one how appropriate is the acronym of their institution.

The following is the report which *The Times of India* had carried on the feature.

Indian N-plants most unsafe, says CBS

Washington, Fcbmaty 14.

CBS 60 minutes, which has a very large nation-wide audience, today charged that India is operating the most unsafe nuclear plants in the world without inspection by the International Atomic Energy Agency (IAEA), reports PTI.

The programme dovetails with the U.S. government policy of demanding fulls cope safeguards in India and depriving the Indian armed forces, if they can, of any modern missile technology on the pretext that what India does is destabilising vis-a-vis Pakistan.

The programme is expected to he used both by officials and members of Congress to put further pressure on India.

The programme did carry an interview with an Indian official but in a context that cast doubt on the truth of what he was saying about India's ability to run nuclear plants without the IAEA holding its hand.

The programme also charged that no care is taken for the safety of either the workers or the people near the plants with the result that workers are .severely injured (pictures of burn marks were shown).

With confirmation by an American-trained Indian doctor, CBS TV also said that due largely to the radioactive contamination, children are born in areas nearby without ears, with two thumbs and so on.

An English analyst, Mr. Steven Thomas, who said that he had been closely tracking the Indian nuclear programme for 15 years, said that India's nuclear plants had far more emergency shutdowns than in any country in the world and that this was a sure sign of trouble Things were going wrong all the time, he said.

Almost as an afterthought, the network said the rest of the world is denying India not only nuclear equipment and fuel but also safety equipment in order to curb India's programme (unless it agrees to the M.S. demand for fullscope safeguards.)

The network also said that the U.S. nuclear regulatory commission said in a report that the fire in the reactor at Narora "was a close call. Just how close may never be known "

The network did not explain why western governments, if they are so concerned about the safety of India's nuclear plants, are banning the export of nuclear safety systems for India.

But it complained that while attention is being paid to unsafe reactors in Russia and to the nuclear programmes of countries like Iran, "one country that has largely escaped scrutiny is India where nothing seems as important as its membership in the nuclear club. Over the years it has steadfastly kept international safety inspectors out of its facilities while pursuing one of the most dangerous and essentially secret nuclear programmes in the world."

Just last year, said the network, there had been 136 nuclear incidents and five of them ended up killing people. It noted a Bombay newspaper as calling the U.S.-built and internationally inspected Tarapur power plant one of the most contaminated power stations of its kind in the world.

"Vilification Campaign"

The BARC chief denounced this programme as "a vilification campaign aimed at discrediting the country's nuclear energy programme and raising doubts about its technological capability."Commenting on the charge that India proposed to become a member of the nuclear club, Prasad said "this is a dead give-away of the real intentions of such a vilification campaign." Prasad "urged all members of the scientific community to counter such propaganda in the interests of the country."

I am struck by two related questions. First, why are these foreigners suddenly so interested in our nuclear programme. The problems that beset the Indian nuclear muddle are of long standing. The fact that "things are going wrong all the time" has been known for ages. We at *Anumukti* have been saying the same thing for the last seven years without fail six times a year. Then why is it that all of a sudden US TV programmes with a viewer ship of millions have suddenly found this newsworthy?

The other question is what I posed at the beginning of the article regarding the protest by senior Indian nucleocrats. Don't they have anything better to do then 'answering' all and sundry charges leveled in TV shows? I am inclined to believe that may be the nuclear programme is not in such dire straits after all, seeing the amount of time these high officials have for the press media.

Recently, Dr. M. R. Srinivasan, the ex-chairman of the Department of Atomic Energy, wrote a series of three articles on nuclear power. The following is an extract from the third article in the series which was published in *The Hindu* on 13th January, 1994.

Dismal State of Nuclear Finances

"We are at present producing only about two per cent of our electricity from nuclear sources. If we had implemented the programme of 10,000 MW of nuclear power by 2000 AD, some 10 to 15 per cent of the electricity would have come from nuclear energy., After 1990, funding of the nuclear power programme has dropped drastically and the target has slipped to some 3,000 to 4,000 MW by 2000 AD.

"An important component of the long term plan was induction of 500 MW reactors of heavy water type, based on indigenous technology. Unfortunately, no funds have been made available for starting construction, although the design work has been completed. In the new economic environment prevailing, the Government is allergic to funding power projects and would like the capital market to be tapped. This may be in order for thermal power plants burning coal, oil, or gas but will not help in the growth of nuclear power.

France to the Rescue?

"France which has an enviable nuclear power programme has built it up largely through public funding and bonds issued by the Electricite du France. In addition to pursuing the heavy water reactor line based on indigenous technology the country should explore the possibility of building some light water reactors also, as the 1,000 MW PWR has become the equivalent of Boeing 747. In 1988, India and the former Soviet Union agreed to cooperate on building two 1000 MW plants at a site in the southern tip of India. However, with the collapse of the Soviet Union, this project is a nonstarter.

"At that time, the French industry, in cooperation with Germany, was keen to build in India some PWRs. France had then not signed the NPT and India could have got these reactors without acceding to the NPT or accepting full scope safeguards. The situation has changed after France joined the NPT in 1992. However, India may still explore a way out if a joint French Gorman—Indian ownership of the reactors were feasible, through a tripartite investment.

"Since the nuclear industries of France and Germany are starved of orders, they may welcome such an option. India may be able to have some PWRs, without having to sign NPT or accepting fullscope safeguards. Enriched uranium for these stations will have to come from France. In this way, the country will be able to speed up nuclear power development, without giving up India's reactor line based on heavy water and natural uranium, or the basic position on NPT or safeguards.

"What the country needs is a continuing political commitment to nuclear power. For its part the scientific and technical community must take on an activist posture to convince the public of the relevance of nuclear power and seek its full support. If these initiatives are not taken, the country will miss the benefits that nuclear technology promised. The dedicated work done by the large band of pioneers in mastering a difficult technology will then have been in vain."

I have quoted Dr. Srinivasan at length, because I think he does shed valuable light on the questions I had raised earlier The Indian nuclear programme, this monstrous undertaking involving an outlay of billions and the lives of many, is actually just a pawn in the game of power politics. Foreign networks have suddenly become interested for two reasons. Firstly because it is time to renew signatures on the NPT and this time the big boys do not want bit players like India to get away without signing on the dotted line. After getting that signature these commercial interests would be extremely keen to sell India their technology and ^{4}knowhow\ Like what has happened in Eastern Europe and the former Soviet Union, they are not interested in a safer, cleaner non-nuclear world but only in selling their much touted 'safe' nuclear technology. The Indian nuclear establishment is equally keen to establish links with foreign nuclear industry. The belligerent "determination to forge ahead in frontline areas of science and technology is all a sham. If these links can be forged without having to sign on NPT, so much the better. But if worst comes to worst, and they have to find a fig leaf to cover themselves, well 'libralisation'and globalisation are the key words today and a high sounding justification would be found. Western nuclear industry, starved of orders at home *(how come? Drs. Sritivasan and Prasad, if nuclear energy is such a panacea?)* would pressure Western governments to look the other way as they have been doing till now. It is a question of who blinks first on NPT but on the wider issue of nuclear power Indian and Western governments and the nuclear industry are on the same side and against the better interests of the people.

I am also amused at the call to the scientific community to take up pronuke activism made by both Dr. Srinivasan and by Dr. Prasad. The wollspring of activism is deep conviction born out of truth and compassion. A system which breeds lies and deception and an arrogant contempt for people as nuclear power does, cannot give rise to activism. It is not the vocation of people out to "make a living".

Surendra Gadehar

AERB Admits Nuclear Workers Exposed to High Radiation Levels

The Atomic Energy Regulatory Board (AERB) admits workers in Indian nuclear plants are exposed to "very high" levels of radiation, but opposes workers* demands for financial compensation on the ground this would lead to "undesirable practices and laxity in providing the necessary protection."

According to AERB Chairman Dr. Gopalakrishnan, radiation workers' demands for compensation in the form of radiation leave or radiation work allowance are inappropriate and unjustifiable. While the board is aware that the collective dose to workers in Indian nuclear plants is very high—individual doses appear to be kept within "acceptable levels".

Dr. Gopalakrishnan told a recent meeting here of the Indian Association for Radiation Protection that reducing the individual doses alone without bringing down the overall man-rem consumption is not an acceptable strategy, and said the AERB has directed management's to give top priority to reduction of the collective dose.

Qualified persons from outside the Department of Atomic Energy should be inducted on to various committees which are looking into the causes of overexposure and the decisions of the committees should be conveyed to the workers in writing Dr. Gopalakrishnan said. The public at large would feel more comfortable if evaluation of radiation doses received by workers in Department of Atomic Energy (DAE) installations were done by an outside agency rather than by scientists at BARC. The AERB would lay down standards and monitor the independent non-Governmental agency which could initially be given the task of evaluating workers' TLD badges.

"Under a new set of guidelines issued by the AERB in January, India has become one of the few nations to fully meet the dose limit for radiation workers stipulated by the International Commission on Radiological Protection(ICRP)." It was imperative to impose a cumulative dose limit of 100 mSv over a five-year block starting with January, while keeping in place the currently stipulated upper limit of 30 mSv for annual exposure, Dr. Gopalakrishnan said. "These limits are well within the ICRP recommendations."

Employers would have to seriously analyse the activities of overexposed workers. Dr. Gopalakrishnan said, emphasising the need for increased automation and robotics, proper radiation shielding, decontamination of areas and equipment and consistently good housekeeping.

*News report in The Pioneer 3.2.*94.

Nuclear Power Corporation Brings Out the Begging Bowl

The first estimate of financial damage to the Nuclear Power Corporation due to the devastating fire last year at the Narora nuclear plant's reactor unit-1 had spoken of a figure in the neighbourhood of Rs 150 crores. Later revised reports had put the figure more conservatively at Rs 40 crores. Dr Chidambaram, the chairman of the Department of Atomic Energy had claimed then that the crippled reactor would be back in operation in just four months. "The fire will cause an extra delay of just two months in the resumption of operation of the unit, since anyway it was scheduled for a two months annual shutdown for maintenance purposes." The unit has still nrt resumed production although nearly an year has passed. An year's interest on the huge investment, has already made the first 'hurried' guess of the monetory loss closer to the truth.

Following the fire, the Atomic Energy Regulatory Board (AERB) directed the Nuclear Power Corporation (NPC) to shut down its plants one after another for inspection. The inspection was intended to avoid a repeat of the Narora incident. Thereafter, it was proposed that during the 6-8 week annual shutdown of the plants, modified turbine blading would be installed in these plants. This step has been necessiated due to the fact that the turbine blades which were manufactured by BHEL have shown a tendency to shear. The original design of the blades was supplied by GE and there have been a large number of instances of similar problems reported in GE blades as well in the past.

The shutdowns are only one of the multitude of problems that plague NPC. As a result, even the reduced target of 5,000 MW of installed capacity by the end of the century seems too ambitious, and the likely achievable target is only 2820 MW. This is because of a major resource crunch in the face of the government's progressively decreasing budgetary support. The government's contribution has come down from 63 per cent of the approved outlay in 1988-89 to **a** low of 15 per cent year before **last** and just 17 per cent last year. I do not know the figure for the current year.

Meanwhile, the corporation's market borrowings have been rising steadily and now stand **at** Rs. 1,884 crores. This translates to an annual interest burden of Rs. 257 crores payable from 1995 onwards. Further, the corporation owes about Rs. 800 crores to the department of atomic energy (DAE) as fuel and heavy water charges and this amount is reported to be increasing at the rate of Rs. 400 crores per year.

A proposal for converting NPC's **dues** to DAE into equity is pending before the government, says Mr. C.K, Koshy, the corporation's executive director for personnel and finance. However, the move can be justified only if a definite turn-around is fenvisaged in NPC's fortunes, since it amounts to increasing the government's stake in the corporation.

NPC needs about Rs. 4,000 crores to complete its ongoing projects over the next seven years. Opinion is divided over continuing with advance procurement for projects which are yet to take any tangible shape. It is felt that all the resources should be directed towards completing the ongoing projects on schedule. This will considerably improve the funds situation as about 35 per cent of the available funds are currently used for advance procurement.

Run For Cover

An interesting aspect of nuclear power plant safety in India is that the NPC and the government-owned General Insurance Corp. (GIC) have not been able to come to any agreement regarding insurance of the plants. The insurance company, though government-owned, usually takes a reinsurance cover from one of the London "clubs" and is not willing to cover the entire risk of an accident by itself The NPC is not willing to involve "any foreigner" in examining its plants in case there is an accident and claims have to be settled. GIC is not able to guarantee complete secrecy of the plant operations and so far has not insured the nuclear power plants.

Nucleonics Week June 17, 1993

However, Mr. Koshy says that since the raising of funds is an annual exercise, the corporation's target should be revised in the context of the availability of funds. He adds that advance procurement has already been reduced in the same proportion as the scaling down of the corporation's target, except in cases where contractual agreements existed.

In their defence, NPC officials say that the government has backed out of its earlier commitment of meeting half the project cost as well as the interest burden while NPC was expected to raise the rest. They also say that the earlier target of 10,000 MW of installed capacity by the year 2000 was something that the government had projected on non-economic assumptions, and that they themselves would not have taken a decision to increase capacity tenfold. It may be recalled that installed capacity was 840 MW in 1984 when the decision was taken to increase it to 10,000 MW.

If NPC's finances are in trouble, so are various aspects of its operations and management, To begin with the corporation's average capacity utilisation for 1992 was a poor 53 per cent while the availability factor was only slightly higher at 64 per cent. The corporation's project completion in some cases has taken as much as 12 years in comparisen to seven years in developed countries. Also worrisome is the fact that over the past years NPC's profits have shown no increase despite separate accounting for projects and generation. In addition, the employee strength has gone up from 1,300 six years ago to 2,300 today. NPC employees' association put the blame for the poor financial state on mismanagement by officials.

On its part NPC has been investigating alternate means of finance. Some state governments are reported to have shown an interest for their respective electricity boards entering into equity participation with NPC, However, certain quarters within NPC are hesitant to enter into any such alliance since NPC is still to recover Rs. 480 crores (including penal interest) from various state electricity boards to which it has supplied power.

But there does seem to be one thing over which most people in NPC are agreed. They agree that a macro-level decision questioning the very relevance of nuclear power in the Indian context needs to be taken. And if the verdict is to continue with it, then it must be backed up with sufficient funds.

Based on newsreports in Times of India, Jansatta and Indian EXPRESS

Uranium Tipped Ammunition

During the uranium enrichment process required to make nuclear weapons or fuel for reactors, the concentration of the 'fissile' U-235 isotope has to be increased. What is left, is called depleted uranium (DU). It is about half as radioactive as natural uranium, but very dense and extremely hard. In a powdery form it burns easily and is hence a very good material for armour piercing shells. Because it is a waste product of the nuclear industry, it is probably supplied free to weapons' manufacturers.

A 1979 British defence ministry memorandum states that tungsten alloys were then in *use* but: "The effectiveness of armour-piercing tank gun ammunition depends largely on the density of the metal from which it is made. DU has proved the most effective anti-armour penetrator and is also consideraably cheaper than tungsten.

External radiation levels from depleted uranium are low. Standing near a DU contaminated vehicle shouldn't be any more harmful than background radiation, as far as external radiation is concerned. However, DU is about as toxic as lead and could be harmful to the kidneys if eaten or inhaled. When DU burns in a fire, it converts into a form which can be readily absorbed by the body. If ingested or inhaled, the toxic effects of DU dust could damage the kidneys, and the short range alpha radiation emitted would increase the risk of contracting cancer

Reasons for Concern

British Atomic Energy Authority estimates that the tens of thousands of rounds of penetrator DU bullets fired during the war left behind 41 tonnes of radioactive debris scat* tered over Kuwait and Iraq.

Just loading a DU bullet exposes tank crews to the equivalent of one chest x-ray every 20-30 hours. British troops have complained of memory loss, fatigue, skin disorders, headaches, eye and ear infections, bleeding gums, hair and weight loss, facial paralysis, damaged lungs and general collapse of the immune ays-

Protesters Beware!

Incongruously, the nuclear industry is promoting a non-lethal weapon. Sandia National Laboratories— a nuclear weapon's establishment in New Mexico specialising in nuclear safeguards— designed a sticky foam which could flood nuclear stores, preventing theft by terrorist or freelance bomb maker.

Now, with an idea stolen from 2000 AD's comic-book star Judge Dredd, the company is developing a method of firing the foam at people for use in riot control. There is still one major problem to overcome, a familiar one for the nuclear industry, how to clean up the mess afterwards.

Perhaps they could just entomb the sticky rioters in concrete for 100 years while they figure out how to decommission them.

Safe Energy February / March 1994

tern. According to the UK Atomic Energy Authority, there is' enough DU in Kuwait and southern Iraq to cause 500,000 potential deaths. But documents released under the US Freedom of Information Act indicate there could be as much as 300 tonnes of DU out there — with a potential death toll of 3.75 million!

The US Defense Department admitted in a memorandum in May '91 that the use of depleted uranium "results in remnants that are subject to atmospheric oxidation and/or aqueous corrosion. Either process can 4ead to environmental contamination that has the potential to cause adverse impacts on human health, primarily through the water pathway ...
"Surface oxidation of fragments of depleted uranium penetrators is a significant process because oxidised forms of uranium are more soluble in water, and thus potentially more available for ingestion by humans and animals."

Although the US has spent a lot of money recovering contaminated US military vehicles from the battlefield and returning them home for disposal as nuclear waste, nothing has been done in Iraq and little in Kuwait to recover these remaining DU rounds. Cleanup workers in Kuwait have been unprepared to deal with the hundreds of contaminated Iraqi vehicles.

The province of Saskatchewan in Canada is investigating whether Canadian uranium was illegally diverted to make depleted uranium penetrator bullets, which were subsequently used by US during the Gulf War.

Moreover, Iraqi and Kuwaiti children have been found playing with the bullets. Saskatchewan's Inter-Church Uranium Committee, which claims at least a 450,000 kilos of Canadian uranium were covertly turned into DU bullets for the US military, is alarmed at the rising incidence of cancer and leukaemia among Kuwaiti children.

Safe Energy
Oct—Nov. 1993

Subscription Information

Rs. 30/- per year (6 issues) within India
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampoorna Kranti Vidyalaya
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PRINTED MATTER BOOK POST

ANUMUKTI

A J urnol Devoted to Non-Nuclear India

Volume 7 Number 5 April / May 1994

The B and palnt of Mice and Men

Consider the following:
"Radioactive material transport has maintained an excellent record of safety in India. This is primarily due to strict enforcement of national regulations. The regulations emphasize on the bulit-in safety of packages rather than operational controls in order to ensure that the transport workers and members of the public are adequately protected against radiation hazards in normal as well as accidental conditions of transport. The packaging containing radioactive materia shall be designed to withstand the rigours of transport

"The number of radioactive material packages transported in India increased from about 12,600 packages in 1961 to over 24,000 in 1992. It is estimated that more than 10 million packages are transported each year throughout the world

'In India, the Chairman, Atomic Energy Regulatory Board (AERB), is the competent authority for enforcing regulations relating to radiation safety including transport Transport of radioactive materials is governed by the surveillance procedures issued under the Radiation Protection Rules, 1971 and the safety code, AERBATR-1, 1986 issued by AERB. The safety code is based on the international standard of International Atomic Energy Agency (IAEA). The IAEA regulations are incorporated in regulations of various international organisations such as International Air Transport Association (IATA), International Civil Aviation Organisation (ICAO), International Maritime Organisation (EMO); Universal Postal Union (UPU) etc. and national regulations of member states."

I am quoting all this from an unimpeachable source—Newsletter of the Atomic Energy Regulatory Board. Now consider this:
"During month of October, 1993 a radiography agency collected a 1.6 TBq (43Cis) Ir-192 source in a Techops-660 camera. The above camera was packed in a steel trunk along with accessories and was taken to railway station to be taken to a radiography site. The above parcel was booked in a brake-van without any mention of the nature of the contents or declaring its correct value. Alter handing over the trunk containing lechops-camera to parcel clerk the radiographer did not check whether the above parcel was booked in a particular train. He did not travel by the train in which the parcel was supposed to have been loaded. Immediately upon arriving he did not check whether the parcel containing the radioactive material has reached or not. Next day morning when he went to collect the above parcel he was told by railway official* that it is missing. The loss of the radiography camera along with source could have been avoided if the accepted secure mode of transport had been used. The radiographer leaving the parcel in the booking office was away from the station for a longtime.

"Radiation Protection Services Division was not informed immediately by the party of the missing camera containing source. Nearly ten days later a search using radiation detection equipment was carried out but with no success. Scrap dealers shops have also been checked for missing source.*

From The Editor's 'Desk

There was a time when Gujarat was the land of Gandhi, Jinnah and Sardar—a land that taught the world that courtsey and good manners in dealing with one's opponents were not a sign of weakness but of strength. One could be totally uncompromising in one's adherance to a principled stand, be the Iron Man of India and yet combine this mule-like stubbornness with grace and magnanimity that would charm one's most intractable opponents. Alas, those days are history. Today's Gujarat is not the land of the old Sardar but of the new, self-styled one. Anti-social boors rule the roost using muscle and money power with active connivance of state machinary.

The incident at Barod vhere thugs masquerading as political activists vandalised the office of mada Bachao Andolan is an outrage even in these devalued times.' fact that some sections of the Gujarati press, hailed the attack only derscores the total moral bankruptcy that engulfs even so called 'ectuals. However, the forthright condemnation of the attack by so the staunchest supporters of the dam is a silver lining. It is high the innate good sense amongst the ordinary people of Gu, lf and a halt is cried to this goose-step march in Hitler's footsteps.

Action en

"The radi raphy agency was asked to suspend the radiography operations and return all radiography sources immediately."

The above is taken from another unimpeachable souce: An information notice issued by the Radiation Protection Services Division of the Bhabha Atomic Research Centre and sent to all users of industrial gamma radiography sources.

Remember Galania

Around the end of 1985, a private radiotherapy institute, the Institute Goiano de Radioterapia in Goiania, Brazil, moved to new premises, taking with it a cobalt-60 teletherapy unit and leaving in place a caesium-137 teletherapy unit without notifying the licensing authority as required under the terms of the institutes license. The former premises were subsequently partly demolished. On 13 September 1987, two people entered the premises and thinking that the unit might have some scrap value, removed the source assembly which they took home and tried to dismantle. In the attempt the source capsule was ruptured. The remnants of the source assembly were sold for scrap to a junkyard owner. He noticed that the source material glowed blue in the dark. Several persons were fascinated by this and over a period of days friends and relatives came and saw the phenomenon. Fragments of the source the size of rice grains were distributed to several families. This proceeded for five days, by which time a number of people were showing gastrointestinal symptoms arising from their exposure to radiation from the source.

The symptoms were not initially recognised as being due to irradiation. However, one of the persons irradiated connected the illnesses with the source capsule and took the remnants to the public health department in the city. This action began a chain of events which led to the discovery of the accident, which was one of the most serious radiological accidents ever to have occurred. In all over 112,000 persons were monitored, of whom 249 were found to be contaminated either internally or externally, 20 persons required hospitalization and four people died of acute radiation syndrome within four weeks of the accident. (The Bulletin of the International Atomic Energy Agency)

So, here we have this 43 Curies Iridium-192 source which is lost'. The 'action taken[1] in this case is a typical instance of the way corporate polluters are 'punished'. Even the name of the radiography unit involved in this grossly irresponsible act has not been mentioned lest it give offense. Is that a way these companies using horridly dangerous substances can be made to mend their ways? Iridium-192 gives out strong gamma rays which require a shielding of one to six centimetres of steel. It also gives out beta rays which can cause skin burns. Iriaium-192 has a half-life of 74 days which means that it would be two to four years before its radioactivity decays to about one millionth of its present value. 43 Curies is a huge amount of radioactivity. For comparison sake, the radioactive sources which had been dumped in the river Cooum in Madras last September (See Much a Dooum on the Cooum in Anumukti Vol. 7 No. 2 October/November 93) according to the publication Nuclear India of the Department of Atomic Energy were 1.5 Curies—caesium, 18 and 0.5 Curies—Americium-Beryllium neutron sources respectively To recover these sources, the Atomic Energy Regulatory Board showed exemplary alertness and these were recovered after a month of intensive effort and the expenditure of about 40 lakhs of rupees. What does Dr. Gopalakrishnan, the AERB supremo propose to do to mitigate this new menace and recover this radioactive camera, or does he find the slush and stink of the Cooum more congenial than the chaos that is Indian Railways?

Old Reactors Never Die
Neither Do They Just Fade Away.

It is High Time Tarapur Was Decommissioned

Nucleocrata who decided to commission the two Boiling Water Reactors (BWR) at Tarapur on 1st April 1969, knew what they were doing. They were playing a huge practical joke on the nation in keeping with the traditions long associated with the date.

The decision to Ibuild a nuclear power station in the Western region was taken in 1968. TVirapur, 100km north of Bombay was chosen as a site in August I960. Preliminary agreements uild TAPS were signed in August 1963. Each unit was to be similar to the Dresden-1 reactor which had been built by GE and completed in 1960. A loan of 80 million dollars was made by USAID toward the reactor cost and the fabrication of the initial fuel charge. This came at an interest rate of 3/4% and repayment was to be over a thirty year period beginning June 1976. Construction began in October 1964 and GE gave a firm completion date of October 1968 as well as guarantees about the output and the efficiency of the station. But a problem arose in 1968 when it was found that cracks had appeared in certain stainless steel components connected with the reactor vessel. This problem also occurred in a similar plant built at Oyster Creek, New Jersey. A programme of repair and modification was carried out at the expense of the contractor. Mainly as a result of this problem the completion of TAPS was delayed to October 1969, in which month it came to full power and produced commercial electricity for the first time. In compensation for the delay GE paid damages of Rs. 1.2 million. However, a bonus of Rs. 26 million was paid to GE on account of the net electric output being rated higher than specified in the contract (400 MWe rather than 380 MWe).

Operpting History

The Tarapur reactors have earned the distinction of being labeled the distiest reactors in the world" This designation is amply justified by a quick glance at its operating history. Radiation contamination of the reactor building and its environs has been hundreds of times higher than the design intent. Consequently, the radiation dose received by workers has been extremely high. In the initial years, TAPS was manned by a few hundred workers, (560 in 1970) who received a collective dose of 153 rems. In just a few years, the number of workers had increased sevenfold and the collective dose they got had also jumped ten times to 5,057 rems in 1977. The reason for the expansion in the regular workforce and the explosion in the population of 'casual* workers has been the need to keep occupational doses within internationally accepted limits set by ICRP. A comparison of radiation doses received by workers in Tarapur compared with dories received by workers at Dresden-1 plant (which was the 'prototype' plant whose technology was almost ten years older,) is shocking Over the years 1960 to 1970 exposure level at Dresden-1 normalised for electricity production were ten to fifteen times lower than those at TAPS,

Other' objective' criteria like capacity factors, the rate of forced shutdowns, 'unusual incident rate'. the amount of high level radioactive wastes stored at the station, the amount of low-level radioactive waste discharged to the environment, the amount of average 'down' time of the reactor, etc. all show that TAPS fares poorly in comparison with U.S. reactors of the same Vintage' However, since the performance of other Indian reactors of the CANDU type has been even more dismal, Indian nucleocrata have a great fondness for TAPS and are inordinately proud of it.

In 1984 unit-2, and in 1985 unit 1 of TAPS were both officially 'derated' to a capacity of 160 MWe each This was done because ofT irreparable leaks in the secondary steam generators which were isolated and taken out from the system. However, as a result of this, the moisture content of the steam has increased inside the turbines and has resulted in extensive corrosion/erosion of turbine parts including the blades. Erosion problems are not a new phenomena at TAPS, and had begun to appear even during the preliminary stage of reactor operations.

"Not A Quality Product"

TAPS reactors were built at the same time as the reactor at Oyster Creek in New Jersey, U.S.A The Oyster Creek plant suffered the same problems of cracking of stainless steel components of its reactor vessel that delayed Tarapur Thus, a look at Oyster Creek's performance in the U.S. context and its comparison with TAPS can provide a useful insight. Below we quote from a re-

cent assesk ent of Oyster Creek brought out . a briefing paper by Nuclear Infomtion and Resource Service.

Oyster Creek is lagued by a history of poor operai ng performance and high operatioy and maintenance costs. According to the U.S. Department of Energy, the routine day-to -day expense to run Oyster Creek over a two year combined average for 1990 and 1991 was over 105 million, ranking it the fifth most expensive reactor to rate payers at $ 162 per kilowatt.

The New Jersey Department of the Public Advocate, Division of Rate Counsel concluded in July, 1990 testimony before the New Jersey Board of Public Utilities that, based on the historical operating performance and costs of the Oyster Creek reactor, "early retirement of the plant and the installation of replacement power would be less expensive to the rate payer than continued operation through the remainder of its planned service life" by as much as $ 1 billion if it were shut down today.

Oyster Creek is one of the most radioactively "dirty" nuclear reactors in the country. From 1988 to 1989, the reactor ranked highest in the nation for worker exposure to radiation, and third highest in the nation with the combined averages for the years 1990 to 1992. Oyster Creek routinely releases radioactive gases and particulates as part of its normal operations. According to NRC documents, nearly all of these releases to the environment are deliberate, ranging from 249 curies in 1989 to over 1 million curies in 1979.

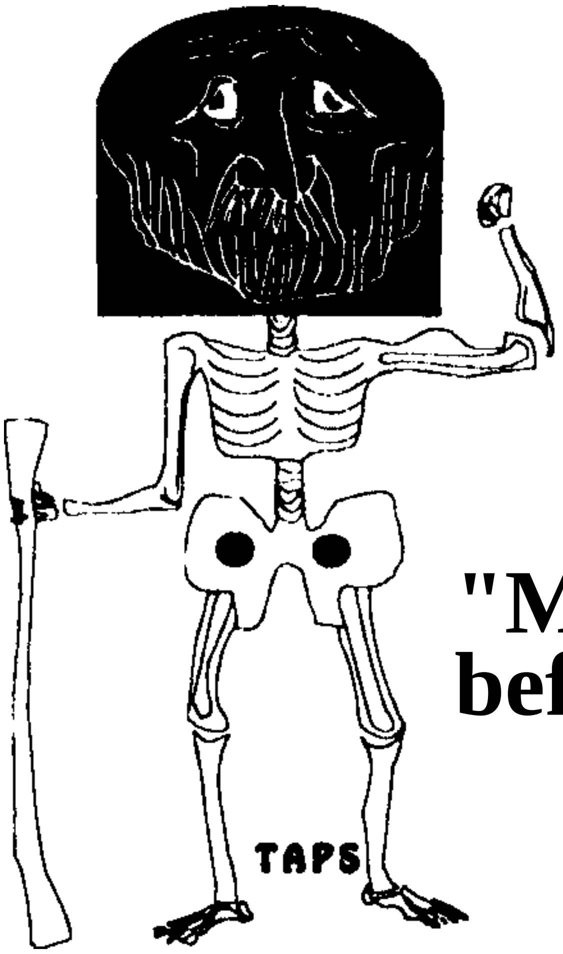
The Nuclear Regulatory Commission (NRC) has identified Oyster Creek as one of fifteen reactors where the reactor vessels are so weakened by radiation that the reactors'safety have been called further into question. NRC now believes that Oyster Creek may be susceptible, along with other GE Mark 1 reactors, to cracking of certain reactor vessel internals as a result of high radiation exposure. Two Mark l's in North Carolina were discovered to have cracks in the reactor core shroud which under certain conditions could shift and prevent the control rods from shutting the plant down. These cracks are obvious signs of premature aging that further indicate the need to retire these reactors.

A containment that does not contain

In an effort to gain a cost competitive edge, GE decided to build a smaller containment building than its rivals, opting for a "pressure suppression" system which tiades off large containment buildings for pools of water under the reactor designed to condense steam buildup during a core melt accident. This design has caused concern among regulatory officials, as studies have shown that its containment is virtually certain to fail during accident conditions in "as early as forty minutes." In fact, in 1986, the former head of the Nuclear Regulatory Commission (NRC) office of Nuclear Reactor Regulation, Harold Denton, told an industry trade group that there was a 90% probability that the Mark 1 containment would fail in an accident involving a core melt accident.

As early as 1975, three General Electric engineers wrote an internal report highly critical of their own company's nuclear reactors. The Reed Report, as it became known, was kept secret by GE and the NRC until 1987, when it was released under pressure of state and local governments and safe energy organisations. The GE engineers detailed dozens of safety and economic problems with the reactor design, concluding that GE reactors are "not a quality product."

However, Oyster Creek performance using the objective criteria mentioned earlier, shines in comparison to that of TAPS.



"Miles to go before I sleep"

A Potent New Danger

Lethally radioactive and thermally hot nuclear waste in the form of irradiated fuel rods from commercial reactors is being stockpiled in ever increasing volumes at nuclear power plants in the absence of a viable technology for its long term management. These radioactive fuel rods are removed from the reactor core and placed underwater in large storage pools to cool the fuel and to shield the environment from the intense radiation. Many reactor sites now have exceeded by several times the original design capacity of their storage pools.

On October 1, 1993 David Lochbaum and Michael Prevatte, two engineers working to raise the power output of a similar Boiling Water Reactor at Susquehanna, Pennslvania formally presented findings to the NRC that potentially affect all Boiling Water Reactors (BWR) in the United States as well as a number of GE BWRs overseas. Lochbaum and Prevatte found that in general, GE's Boiling Water Reactors have serious design defects for handling loss of coolant water to the fuel pool associated with a credible Loss of Coolant Accident (LOCA) in the reactor.

These defects can produce potentially catastrophic results, including:

- The melting of the fuel in the pool which is located outside reactor containment.
- The failure of the reactor vessel and all reactor building safety systems.
- The failure of all radiation containment systems.
- The Loss of Off-Site Power (LOOP) associated with a LOCA or a combination of these events at the reactor which could lead to the boiling of the coolant in the fuel pool. As one example, the activation of the emergency core cooling system (ECCS) forcing water on a super hot reactor core would create a large hydrodynamic force (much like experiencing a giant "ting" in a home hot water radiator) in the steam suppression system of the plant, essential feed water pipes to the fuel pool are not seismologically qualified to hold up to postulated forces generated by this hydrodynamic force and could break, additionally, Lochbaum and Prevatte identified other design deficiencies involving the power systems to the fuel pool cooling and makeup water pump system that could be de-energized by a "load shed" mechanism associated" with a LOCA. In many reactors, like Susquehanna, plant operators would then need to open manually operated valves to provide emergency water to the fuel pool. The radiation fields could be on the order of 5000 rems/hr, posing certain death to operators attempting these "heroic measures." The resulting failure of this system would be the boiling off of cooling water to the irradiated fuel storage pool and the meltdown of several hundred tons of irradiated fuel /nuclear waste, resulting in an unanalysed catastrophic release of radioactivity off-site to the environment.

The boil off of the fuel pool cooling water itself would further challenge additional plant system design deficiencies. For example, the heating, ventilation, and air conditioning ductwork for the reactor building is not designed to handle the large volumes of condensation created by the boil off, causing the system to fail because of condensate accumulation or blockage. Safety equipment in the reactor building is not qualified for the temperatures and water collection potentially resulting from the failure of this system. Lochbaum and Prevatte concluded that in a rapid cascade of events, safety systems would then fail, resulting in the melting of the reactor core, failure of the reactor vessel, failure of primary and secondary containment, and ultimately release of catastrophic amounts of radioactivity to the environment.

The two engineers have urged the Nuclear Regulatory Commission to order the "backfit," or repair, of the Susquehanna reactors and perhaps 30 other reactors of similar design

A Pox on MOX

Instead of quietly celebrating completing 25 years of operation and closing down the reactors forthwith, Indian nucleocrats have decided to continue this folly further. They have spurned an excellent excuse for shutting down the reactors since the French who had been supplying the enriched uranium fuel till now have decided to no longer continue to do so. The decision to replace some of the enriched uranium fuel which is not available in India, with Indian manufactured Mixed Oxide (MOX) fuel is an act of unprecedented criminal irresponsibility

There are problems galore with MOX. Here we mention just a few of them.

- Manufacture of MOX fuel elements leads to higher radiation doses to operators than does manufacture of uranium fuel This is mainly due to the neutron radiation from Pu-isotopes and to the gamma radiation emitted by Americium-241, a daughter product of Plutonium-241. Furthermore, there is the risk of plutonium inhalation if leak tight containment of plutonium is not strictly maintained at all stages of the manufacturing process.

- During ' roceasing and fuel fabrication the risk of plutonium theft , particularly high. During those stages, plutonium is handled and processed as a solution or powder, in quantities of several tonne per year. Current systems of physical protection and material recounting are not sufficiently efffective to prevent the "loss" of several kilograms of plutonium per tonne during the process; they are not even sufficiently accurate to detect such a diversion with reasonable certainty after it has taken place.

- The transport of fresh MOX fuel also constitutes a significant security risk. Two typical fresh BWR-MOX fuel elements, for example, contain more plutonium than is required for the construction of an atomic bomb. And separation of plutonium from fresh fuel rods is much easier than the reprocessing of spent fuel. Fresh MOX fuel could therefore be a highly attractive target for criminal or terrorist groups, or for the agents of states wishing to obtain plutonium. These considerations also apply to the transport of plutonium oxide, which has to be transported, after separation, from the reprocessing plant to the MOX fuel fabrication site.

- The use of MOX fuel in BWRs which were originally designed for uranium fuel only creates additional difficulties. The regulation of the neutron flow in the reactor is made more complicated, in particular due to the neutron absorbing effect of several Plutonium isotopes and Americium-241. The effectiveness of the neutron absorbing control rods is consequently reduced. In order to compensate for this effect, the number of control rods must be increased. There are also a number of further potential safety problems which require compensatory measures as the proportion of MOX in the core increases. The result is that only a maximum of about 30-60% MOX fuel can be loaded into a reactor core under present circumstances.

- Spent MOX fuel is more difficult to transport and store than spent uranium fuel. Due to its higher actinide content, the neutron radiation emitted from spent MOX fuel is much more intense. Even in shielded transport containers, the dose rate at a distance of 1 metre from the transport cask is about twice as high for spent MOX fuel as for spent uranium. This leads to higher radiation exposure not only for transport workers and security staff accompanying the casks, but also for people living along the transport routes.

- MOX also creates additional problems in the final disposal of its waste. The long-term toxicity of the wastes from MOX reprocessing is higher, as is their rate of heat generation. High-level waste from MOX fuel emits about 7 times more heat, per tonne of spent fuel, than does high-level waste from uranium fuel. In the case of direct disposal, without reprocessing, spent MOX fuel generates about 5 to 6 times more heat than spent uranium. Much larger volumes of rock are therefore required in an underground repository in which to position MOX waste or MOX fuel in order to avoid excessively high temperatures, in any case, plutonium recycling in BWRs cannot go on indefinitely. With each cycle, the plutonium becomes more contaminated, and its isotopic composition less favourable. Hence, MOX fuel will have to be disposed of directly anyway, after two *or* three cycles at the most.

- The fact that so many safety and engineering problems are associated with the use of MOX fuel also leads to the inevitable consequence that its use in BWRs is much more expensive than ordinary uranium. Additional shielding and control measures for processing and handling, extra precautions against incorporation of plutonium (for example by inhalation of contaminated dust), as well as extensive security measures all add up to high costs.

A New Era of Hindi-Chini Bhai Bhal

In all the highly glowing accounts of the ingenuity of Indian scientists and their great contribution to the cause of ' self reliance', nobody has seen fit to mention the fact that MOX fuel cannot replace more than 30% for the enriched uranium fuel which was being imported from France and for which there is no available local substitute. What is TAPS going to use for the rest? U.S. and France, who had been supplying the fuel till recently have now declared that they have no intention of supplying till India signs the Nuclear Non-Proliferation Treaty and accepts full-scope safeguards with IAEA inspectors snooping every corner. Recent reports in the Nucleonics Week, the nuclear industry trade journal suggest that it is our old long-lost friends, the Chinese who have assured us that they would step in to fill the breach. Politics, it is said makes strange bedfellows. Nuclear policy makes them stranger still.

Surendra Gadekar
Based on reports from Nuclear Information Resource Service, Nuclear Engineering International, Greenpeace and Nucleonics Week

Aging Problems of Indian Nuclear Plants

An Official View

Our craze for 'phoren is absolutely astounding. Not only do we crave for foreign goods and marry our daughters to foreign returned bridegrooms; not only do we try ingenious tricks to immigrate to foreign shores and in lieu of success in these endeavours watch foreign TV programmes; we give serious consideration only to foreign criticism. Recently, a U.S. TV network, CBS, broadcast a film on India's nuclear power stations entitled "Another Chernobyl?" The film described the Indian nuclear programme as the most dangerous in the world and cited numerous 'instances' of unsafe operating practices at Indian nuclear power plants. It is a sad commentary that this one programme on a foreign TV network has raised more comment in the Indian press than all the reports on Rawatbhata and the BARC leaks put together. Below we reproduce the excerpts from an article by Dr. AGopalakrishnan regarding the defects besetting the Indian nuclear programme. The fact that nucleocrats are now willing to publicly admit that all is not hunky-dory with the programme and even the head of the nuclear establishment Dr. RChidambaram is now pleading for extra funds on such pusillanimous grounds that "the gains made with such efforts in the past should not be allowed to be frittered away", is an indication of the paradigm shift that has already taken place.*

Aging of critical subsystems, structures and components in nuclear power plants, if not closely monitored and checked, could lead to incidents which might have an adverse impact on public health. Let us see what is the status of a comprehensive list of safety-related critical structures, subsystems and components in our Nuclear Power Plants.

In the case of the Tarapur station, there seems to be a somewhat complete list on which everybody (researchers, designers, operators and regulators) agrees. Of course, these are General Electric Boiling Water Reactor (BWR) Stations for which similar information is available from elsewhere for comparison and everything seems to be in good shape. As regards the other 235 MWe Pressurised Heavy Water Reactors (PHWRs), discussions indicate that there is not much of a consensus on the total list among any of the groups, even though everyone agrees on most of the major and obvious constituents such as the pressure tubes, calandria tubes, containment, emergency core cooling systems etc

Unit-2 of the Rajasthan Atomic Power Plant (RAPP 2) and both the units of the Madras Atomic Power Plant (MAPP-1&2) have seen the highest full-power years of operation. A matter of concern in these reactors is the sagging of the pressure tubes. The pressure tubes contain the fuel bundles and the safety concern arises from the fact that such Bagging could lead to contact between the pressure tubes and their reactor vessel tubes, causing enhanced hydrogen embrittlement and the failure of the pressure tubes. The indirect monitoring of the gaps between several pressure tubes and calandria tubes in RAPP-2 has shown the possibility that in several channels the likely contact may have already occurred. Complete in-service inspection of all suspected pressure tubes is currently on.

A great deal of meeting of minds is required between the Bhabha Atomic Research Centre (BARC) and Nuclear Power Corporation (NFC) teams on what are the major safety related issues in the pressurised heavy water plants The vagueness and incompleteness which appear to exist in this area can be removed quickly through collective effort.

Environment and stresses in reactor systems are not easy to characterise. Instrumentation and sensors exist only in limited locations, and in the older plants some of these may be in a non-repairable state. There is very little option but to examine in detail the plant data records, and take help of analytical interpolation between the transient variations in known locations through the use of plant dynamic modelling. A reasonably good model has been developed by the NPC, which is presently under verification. Again, there is ne*ed* to create a careful data bank of environmental changes and associated list of specific stressors which each critical item of each nuclear power plant unit has seen, from the beginning to the present. This is a somewhat painful task now, since such details may not have been kept track of. All the same, creation of this essential data base can no longer be avoided

One often Hi rs statements to the effect that "cob. -benefit aspects" of safety should also be kept in mind by regulatory agencies. If these are to mean that safety stipulations should only be insisted to the extent they can be implemented inder the existing financial constraints of the nuclear facility owner, talking into account the difficulties in getting suitable imported spare parts and indigenous technologies, it just cannot be agreed to. The larger "cost" of potentially impairing the public health and safety should be **the** predominant concern. There can be no negotiation or compromise on lowering the safety standards and norms below internationally acceptable levels, in order to accommodate the unfortunate limitations faced by the facility owner.

Aging related work is of growing importance and it should certainly receive emphasis and larger diversion of funds as time progresses. The formation of a multi-disciplinary task force comprising the NPC, the BARC/IGCAR (Indira Gandhi Centre for Atomic Research) and the AERB, on a full time basis, who can be entrusted with devising a definite and well-knitted programme of activity, should be considered.

Dr. AGopalakrishnan
Atomic Energy Regulatory Board

The Dark Heart of the Nuclear State

The following are excerpts from an article "Burning the house to light a dinner candle" which appeared in a Pakistani newspaper The News.

The peaceful nuclear programme in Pakistan is supposed to be directed towards using nuclear power to generate electricity. The early promise of cheap (perhaps even free), safe, unlimited electricity produced in nuclear power stations is now like a fairy-tale. It stands revealed as a bar gain with the devil, selling the future for the gratification of the here and now. Using nuclear power to make electricity is like burning down your own house to have light to eat your dinner by. (The same image can be used to view nuclear weapons. They amount to soaking yourself and your family in petrol, lighting a match, and saying come on then attack me if you dare.) These aspects have become so clear that nuclear power is on the run in the very countries that pioneered the technology and developed it.

As if intent on repeating every mistake that has ever been made the Pakistani state machine pursues a "nuclear programme" and justifies it in the same tired old western terms. The debate on this issue in Pakistan is restricted. It is as if everyone taking part in it had accepted a set of limits as to what can and cannot be said, and since the limits of debate are set in advance it is no surprise that the same old arguments go around. The reasons given for pursuing the nuclear power programme the raw material, Uranium is in relative abundance compared to oil and gas. Secondly, the power generation process in reliable com} ared to hydroelectric (no load shedding). Thirdly, it has a positive effect on the scientific and technological capability of the state. The acute problems concerning the radioactive contamination of people, of land, air and water for time scales much longer than any other human effect on the environment, which have effectively killed off the nuclear programmes in most Western countries, merit little attention in Pakistan.

Why then, despite the worldwide catalogue of disasters and tragic experiences with nuclear programmes, does a country like Pakistan persist in its "nuclear capability"? In part it is because there is so little real informed debate. How much public debate has there been, for example, on the 300 MW nuclear power station to be built by the Chinese at Chashma? How many people know that this is the only Chinese designed reactor, that there is only one like it in China and that too is only at a trial stage? This design has no history of reliable operation and consequently no-one has experience with its operating characteristics, it is worth thinking about that the Chinese nuclear are relying on reactors build with foreign technology for use in China, rather than using their own design.. Is Pakistan a test-site for Chinese nuclear technology? If anything goes wrong who will pay the price?

The Pakistani nuclear programme is sheltered close to the heart of the state, it is controlled through the Atomic Energy Commission by the Prime Minister's Secretariat, the light of accountability is never allowed to shine in on it. There may be several reasons; perhaps it's because nuclear physicists are such delicate flowers and need to be protected and sheltered; or perhaps it's because those kind, thoughtful people don't want to burden us with all that nuclear physics, which is really too hard for the rest of us to understand. Whatever the reasons, in this darkness, away from the public gaze fierce monsters breed and grow fat and claim, like dragons, to guard a great magical treasure. This is common to all nuclear programmes. All "they" have to do is say the magic words "the National Interest" and everyone goes quiet.

Dr.Zia Mian
The News February 3,1994

The Risks of Old Reactors

On September 21, 1990, the operator at Tennessee Valley Authority Sequoyah Unit 1 nuclear power plant heard something that sounded like a freight train. Seventeen days later the plant was shut down after X-rays revealed that the disc of a check valve in the main steam line was missing. Such check valves are used to prevent reverse flow of steam into'the containment building in the event of a steam-pipe break. The 28-inch diameter disc, weighing several hundred pounds, had broken off and gone bouncing through the main steam pipe. Inspection of the other three check valves in the main steam lines to the turbine showed that two other discs had also broken off.

The Aging Process

Sequoyah Unit 1 is only 12 years old. Yet the check valve incident resulted from age-related degradation of the nuclear plant equipment-degradation that went undetected by routine testing and inspection measures.

The U.S. Nuclear Regulatory Commission (NRC) defines aging as the cumulative degradation of structures, systems, and components over time. Factors that contribute to the aging process include normal wear and vibration; improper installation, use, or maintenance; and conditions under which the system or components have operated. If the effect of aging go undetected or unchecked, they could lead to equipment failures, accidents, or other abnormal plant conditions that could jeopardize safety.

Two major safety problems can result from nuclear plant aging: The probability of an accident (such as a pipe break) can increase, and the probability of the failure of safety systems (such as emergency core cooling) can increase, as well. Age related deterioration of equipment can also result in accidents that are more severe than the safety systems were designed to handle.

In theory, the adverse effect of aging can be corrected by maintenance, repair or replacement of the affected components. For this to successful, however, the causes of the aging must be known; testing and inspection must be capable of detecting the age-related degradation; and the costs of the additional maintenance, repairs, and replacement must be economical enough to warrant continued operation of the plant.

The NRC and the nuclear industry claims that the causes and effects of aging are understood and that routine testing and maintenance are adequate to detect and correct these effects. In 1989, however, the US General Accounting Office reported to congress that:

- **Neither the NRC nor the nuclear industry fully understands the nature and effects of aging on nuclear power plants;**
- **The operating and maintenance practices of each utility are different.**
- **Each plant has a unique history of operating conditions and minor accidents that can accelerate aging by inadequate maintenance, improper testing and abnormal operating conditions.**

In addition, the experience in nuclear plants shows that aging is increasingly the cause of accidents, equipment failures, lengthy plant shutdowns, and expansive repair, and that current testing and maintenance practices ire inadequate to prevent age-relat d failures.

Failures Due to Aging

Many mechanisms contribute to the deterioration of nuclear plant equipment, and virtually every component in a plant is degraded by one or more of those mechanisms. Different types of aging degradation include and sliding surfaces, which can be accelerated by inadequate lubrication, use of an incorrect lubricant because of temperature or contaminants; equipment fatigue caused by vibration or periodic cycles in temperature or pressure, erabrittlement and loss of toughness in the reactor pressure vessels from neutron radiation. Unfortunately, the NRC's program of age- related research covers only about 25 percent of the major equipment important to plant safety and will not be completed until the mid-to late 1990s. Two components affected by aging are emergency diesel generators and check valves.

Emergency Diesel Generators

Emergency diesel generators provide electrical power to run a nuclear plant's safety systems. In the event of reactor shutdown and a loss of main electrical power, the diesel generators must start, achieve rated speed and voltage, and begin supplying power to the plant's safety systems in less than one minute.

Although there are more than 200 diesel generators in use as emergency power sources in US nuclear plants, the complexity of the diesel-generator system and the lack of standardization makes it difficult to use experience in one plant as a means of predicting failures due to

aging in a)ther in plant. From 1965 to 1984, there were over 2,000 reported failures of diesel generators, according to a review conducted for the NRC by Pacific Northwest Laboratory. About t half of the failures appeared to be related to some form of aging degradation. Analysis showed that as plant age increased, so did the percentage of diesel generator failures due to aging. The primary causes of aging failures in the diesel-generator system are vibration, inferior quality of components, adverse environment, and human error during maintenance.

Check Valves.

A check valve is designed to open and allow flow through a pipe in only one direction. When the flow stops or reverses direction, the check valve closes. Several hundred check valves are used in a typical nuclear plant, in both the safety and plant operating systems. Failures of check valves have resulted in water hammer (a condition in which water rapidly fills a void in a pipe then goes slamming against the end), over pressurization of low pressure systems, and damage to other system components. These failures have been caused by severe degradation of hinge pins, hinge arms, discs, and disc nuts. Many have been attributed to tapping of flutter of the check valve discs: When the flow velocity through a check valve is insufficient to cause the disc to reach the fully open position, disc flutter and tapping can occur. The flutter may cause rapid wear of the hinge pin and tapping against the backstop can generate significant impact forces that may result in fatigue of the disc stud.

Even if the check valve is properly designed for normal flow conditions, changes in plant operation can result in rapid wear. In November 1985, for example, in San Onofre Unit 1 in southern California, a severe water hammer extensively damaged a portion of the feed water system because five check valves had failed. The disc stud/nut connection in these check valves had fractured because of repeated impact against the open stop. Although these valves had operated satisfactorily for several years at full power, 15 months prior to the water hammer, plant power had been reduced to 85 percent. This resulted in insufficient flow to keep the discs fully open, causing repeated impacts against the stop and eventual failure of the threaded connection.

Neither the regulators nor the nuclear industry fully understands the nature and effects of aging on nuclear power plants

Unfortunately, the procedures used to test check valves cannot always detect conditions that could lead to their failure. Some check valves cannot be tested while the plant is running because of the adverse effect the testing would have of plant operation And some can never be tested at the required conditions because of the design of the system in which they are used.

Because of weaknesses in periodic testing and the inability to ever test some check valves, utilities periodically disassemble and inspect them. While disassembly provides good information about the condition of a check valve, it has some drawbacks. Aside from the cost and worker radiation exposure, reassembly errors can go undetected in valves that cannot be tested for reverse leakage or cannot be tested under the full flow conditions required during an accident. The NRC research program is attempting to identify methods of determining check valve conditions that would not require disassembly.

One aspect of check valve performance that is not tested and that will become increasingly important as plants age is their ability to withstand the force of rapid closure. If the piping upstream of the valve fails, the flow in the system will reverse rapidly, slamming the check valve closed. If it has degraded because of corrosion, thermal or mechanical fatigue, or other aging effects, the impact of the disc on the seat could rupture the valve, allowing a continuous reverse flow through the valve It is doubtful that the capability of an aging check valve to withstand such a rapid closure could be demonstrated prior to licensing of a nuclear plant. Yet the NRC's aging research program apparently is not investigating the effects of aging on this aspect of check valve performance.

Why Aging is Important

Less than 15% of the nucler plants in the United State have been in operation for more than 20 years, and only 2 small demonstration plants have operated for about 30 years. (One of those, Yankee Rowe, was permanently closed in 1992.) Thus, the nuclear industry has very little experience with aging effects on plants that have operated for even half of their 40-year design life, much less years longer.

Robert D Pollard
The Nucleus Summer 1992
Union of Concerned Scientists

What Rawatbhata Can Learn From Chernobyl Related Research?

A paper entitled *Female Reproductive Function in Areas Affected by Radiation after the Chernobyl Power Station Accident* By V.LKulakov and 14 others has been published in *Environmental Health Perspectives* (Vol.101 Supp.2 Pages 117-123 [1993]). The paper reports the results of a comprehensive survey of the effects of the radiation released from Chernobyl in 1986.The paper concentrates on evaluating pregnancy outcomes and health risk to women and the consequences of the accident on the health of the progeny. The study is restricted to two well defined areas: the Checchersky district of the Gomel region of Belorussia and the Polessky district of the Kiev region in the Ukraine. The results of this study are of special importance to us in India since they show remarkable similarity with the findings of the health survey carried out in the environs of Rajasthan Atomic Power Plant at Rawatbhata.

The Results:

The methodology of the survey involved extensive medical examinations and follow-up cases for up to five years after the accident. While records of almost 7,000 labour histories were examined, detailed medical examinations were carried out on 688 pregnant women and their babies. The studies were carried out for a period of eight years, three years prior to the accident and five years after the accident.

The most important difference between this study and the Rawatbhata health survey, concerns the fact that while Chernobyl was a catastrophic accident, with serious contamination of air, water, soil and food, There has been no known accident at the Rawatbhata site and the officials have always claimed that the contamination of the environment and the food chain is 'negligible' and well within internationally accepted limits.

Health of mothers, fetuses and children badly affected in regions around Chernobyl

Deformities four times higher than before the accident

Disease resistance decreased

There are many striking similarities in the results of both the studies: One, a sharp increase in the number of congenital deformities. In one of the districts covered by the study, there was a four-fold rise in congenital abnormalities. Contrast this with Rawatbhata where one sees a three fold increase in the number of congenital deformities in the population showed an increase by a factor of three as compared to a control population. And children born after both the reactors started operations are more than are five times more at risk of being deformed.

Another common strand in the suffering of people tear Chernobyl and Rawatbhata is the reduction in immune response. While at Rawatbhata, this loss of the body's repair mechanisms was seen by a marked rise in chronic infections like tuberculosis, intractable skin, gastro-intestinal and respiratory problems, the same phenomenon has been directly seen at Chernobyl by measuring immunoglobins in the blood.

Kulakov and co-workers have done an extensive study and they find many other health problems with pregnant mothers, new born babies and children. They find that mothers during pregnancy were more prone to suffer from anemia, thyroid dysfunction, placental insufficiency and hypertension These diseases though not directly related to pregnancy, piny a very powerful role in determining the pregnancy outcome. More commonly known radiation related effects, like platelets aggregation surrounding blood cells were also observed.

One of the major benefits that researchers in India can derive from this paper is that it gives a very fine methodology that can be followed to determine the health effects of low-level radiation. In a future follow-up study in Rawatbhata it would also be good to perform biological dosimetry by counting dicentric chromosomes, and do radiation monitoring of air water, soil and food samples.

Sanghamitra

Testament of faith

Letters from Nuclear Protesters Awaiting Sentencing

GreetingB, Friends.

John Dear, Bruce Friendrich, Phil Berrigan and I acted December 7, 1993 to expose and disarm one weapon of U.S. nuclearism, an F-15E fighter bomber, in readiness at Seymour Johnson Air force Base, north Carolina. Three of us, acting on strong religious beliefs, and I, with strong secular spiritual belief, poured blood and hammered on this bomber to speak truth through action, and to resist militarism and oppression. We acted to concretely disarm a plane which was already used to slaughter Iraqis and which will likely bo used again to slaughter Koreans, or Bosnians (Serbians, Muslims and Croatians alike). We acted to help stop the warmaking madness; to alert and educate the people of North Carolina to their economic dependence on oppression and murder. We acted because our consciences required us to act (in the loving tradition of thousands before us)...

As I awaited this trial separated from my acting community as the only woman among us, I spent long hours considering war, oppression, exploitation, imperialism and death, as well as peace, nonviolence, resistance, economic justice and love. I'll offer just a couple of my very basic conclusions: if you value life, you do not build trillion dollar arsenals for the sole purpose of eliminating it. If you respect life, you do not allow those trillions of dollars of resource to be stolen from the sick, the poor, the dispossessed and our children. If you love life, you do not allow anyone, any power, to do these things in your name.

It is true I have mourned the precious moments, days, months, years stolen from all who are prisoners-for political, economic or psychological reasons, yet, I understand that my freedom is a very small sacrifice when millions throughout the world suffer the torture of our national collective inaction. And, i rejoice- because the action and incarceration of only four have already served to inform, motivate and encourage hundreds more, who will then inform, motivate and encourage hundreds more... to more serious resistance and justice, to greater commitment to concrete, status-quo shattering, creative social change.

Lynn Fredriksson

Dear Sisters and Brothers

...Recently, I read something that helped explain the frightful proliferation of violence in the U.S.-the multiplication of guns, shootings in the schools, more and more suicides, rapes and abuse of children, something seems to be driving us mad, as though we have decided to tear one another apart, decided that everyone is an enemy to be killed. What's behind all this savagery? Is it possible to identify the source?

Perhaps we can consider this. It is a fact that during and after the Vietnam War, American homicides jumped 42%. Isn't this the price we pay for killing millions of Indochinese? More to the point, isn't it inevitable that when the U.S. butchers people abroad, we kill one another at home? Is this the key to the bloodshed on our streets?

Yes on all counts, I would Bay. the government represents us; we pay for it and hold it; it acts for us collectively, when it destroys moral barriers in our name by carpet bombing of Hiroshima and Nagasaki, by leading the nuclear doomsday race, by repeated interventionary war, by wars as our #1 business, these same moral barriers will plunge in our people. If the government cheapens life and attacks it ~ the people will also. We will begin to kill one another with a dreadful compulsion.

We must understand that this government will never admit to criminality, Hazel O'Leary notwithstanding, this government will never disarm its nuclear warheads or demobilize its military. This government will never take responsibility for carnage on our streets. Because this government is irresponsibility, injustice and cruelty.

So much for Washington. As for us, we must be responsible, and nonviolent resistance is the ultimate responsibility.

Resistance is to the American killing machine and its white collar killers. Resistance is to a criminal, insane government and to its killings.

Resistance is the best protection for ourselves, our children, our communities and our people.

In God's name then, and in our own, let us resist the killers and stop their killing.

Philip Berrigan
The. Nudear Resister
March 25, 1994

Whitewash in France

An "Independent" Inquiry Commission Submits a Blinkered Report

On the 22th of February 1994, the French government authorized the restart of the fast breeder nuclear reactor Superphenix (1200 MW) after three and half years of stand-by for safety reasons. This restart was refused in June 1992 because the safety of the installation was not "assured". Although the situation has not changed one bit since then, the pressure from the nuclear lobby overran all concerns regarding the safety of the population, or concern for democratic procedures.

From March to June 1993, a Public Commission of Inquiry investigated the possibility of restarting the reactor. This was demanded by the operating company, NERSA, in October 1992. The Commission published a report which was made public on September 30th, 1993.

The public was allowed to present evidence to the commission and this was largely done. The Commission received 29,412 depositions. Of these, 96% were opposed to the restart of the reactor. The "commissioners" declared that they had no competence on the subject of nuclear technology, but instead of examining the evidence, they asked the NERSA company itself to write the technical aspects of the report. The Commission totally ignored the opposition from various sources including elected representatives, independent technicians, local residents, etc The report does not even give the opinions of the Minister of Environment, national and official institutions like the Social & Economical Council and the Nuclear Information & Safety Superior Council. The Commission has thus fully collaborated with the nuclear lobby to bring out a report which protected its interests.

Mr. Pronost, a member of the Commission, was invited to visit nuclear reactors in Russia and Japan. His visit in Russia gave him "a good impression" and he reported that the fast breeder at Beloyarsk (BN 600 MW) is "in a good state", and that "Russian technicians monitor fully the technics of this kind of reactor". However in fact, in the beginning of 1991, 600 kg of sodium caught fire and three days were needed to put it out, and the fire resulted in a collective irradiation dose of about 200 man-rem. In Japan, he met only nuclear technicians and, therefore according to him "there is no ecological opposition in Japan". Which is patently false, since Japan has a strong and growing antinuclear movement which has organised large national meetings against the fast breeder reactor of Monju (280 MW) in October 1993.

The Commission said that it was not competent to decide on questions of economics, technical problems and safety questions. One wonders what was within its competence?! Moreover, the questions concerning economics, laws, energy choices, nuclear wastes and nuclear in general "were not within the frame of "terms of reference" of the inquiry". Of course, the numerous accidents and incidents at the site since the reactor started in 1986 were not within the frame of its competence ! For the Commission, Superphenix was "the best energy producing machine in the world". It would all be hilariously funny if several millions people ware not within the range of possible irradiation in case of a serious accident.

In December 1993, a meeting of the Parliamentary Office for Scientific & Technical Choices was organised to inform the members of the Parliament regarding the question of restarting the Superphenix nuclear reactor at Creye-Malville. But strangely, no parliamentary debate has ever been conducted regarding the original starting of the reactor since the project was planned in 1976.

Currently some of the unresolved outstanding problems of safety are :

- No safety evaluation of the reactor under actual operating conditions exists.
- The fact that under accident conditions the reactor core can rearrange itself and the heart of the reactor can explode like a nuclear bomb.
- The difficulties regarding use of sodium; and controlling fires of sodium
- Difficulties of intervention inside the containment.
- The operators are not regulated properly and have in the past taken too long to analyze unusual incidents and accidents which have occurred frequently.
- Superphenix produces wastes for millions of years, which we do not know what to do with.
- Superphenix produces weapon's grade plutonium (several hundreds of kilograms since it started in 1986), which contributes to the proliferation of nuclear weapons.

We have fought a long, seemingly never-ending campaign against the new reprocessing plant THORP, the startup of which, although built, we managed to delay for nearly 2 years. We did everything possible, rallied international support, took the Government to court, but ultimately had to accept that big money speaks louder than common sense or concern for the health of the population and that there is no justice.

I often think about the Berlin Global Radiation Victims Conference, meeting you and it seems a lifetime away. Hearing all those testimonies and evidence then and hoping that something dramatic would come of it and looking around what is happening in Britain now, the way the nuclear industry is managing worldwide to steer research away from radiation biology and relying on epidemiological studies to prove that all our problems are caused by viruses and the racing about of workers all over the place is really quite frightening.

I get so angry when I see all this dishonesty, eminent scientists who seem to get 'bought[1] by large amounts of cash being poured into their departments to produce the 'right' results and in contrast others who seem to be doing exciting research into the effects of low-level radiation, being starved of funding.

No doubt, you are aware that we have lost the leukemia court cases which were based on the Martin Gardner theory, due to lack of supportive evidence. This has now been a sign for the nuclear Industry to claim that radiation has nothing to do with ill-health.

I read *your AnumukH* Journal with great interest and hope to use information from the special issue on Rawatbhata in our next 'Waste Paper', we've got to keep pushing the message and tell what is happening. I am enclosing some of our 'Waste papers' which are published quarterly and well put you on our mailing list for future issues.

Janine Allis-Smith
Cumbria

The visit of the AERB chief to Vedchhi is indicative that our long struggle for justice for the people of Rawatbhata is finally beginning to yield some fruitful result. The government has to recognise people's yearnings and I am sure that the future would bring brighter results.

Dr. Rampratap Gupta
Rampura

What Mutual Understanding is proposed to be built? That anti-nuke is right and pro nuke is also right? Where is the gray area where black and white come together? If you have any issues that could be included in such a gray area I would be pleased to know them.

Earlier we had people of the stature of the much respected Dr. Vikram Sarabhai, the second chairman of India's Atomic Energy Commission. He was a concerned scientist who could contain political bosses from giving directions to his department. The offer of a dialogue by Dr. A. Gopalakrishnan chairmen AERB, makes me apprehensive.

- Will the dialogue be open? Will it be fully reported in newspapers?
- What aboufclasaified information* under which everything that *"hurts'* is hidden?
- Has he the freedom to "blow the whistle?" If not how far will he go to lose his job?
- What are the guarantees against misusing our opinions and berating us as misinformed and misguided?

Allow me to quote Gandhi. In March 1922 he told judge Broomfield:

"1 am here therefore to invite and submit to the highest penalty that can be inflicted upon me for what in law is a deliberate crime and what appears to me to be the highest duty of a citizen. The only course open to you, the judge, is either to resign your post and thus disassociate yourself from evil, if you feel that the law you are called upon to administer is an evil and that in reality I am innocent, or to inflict on me the severest penalty, if you believe the system and the laws you are assisting to administer are good for the people of this country, and my activity is therefore injurious to public weal.[9]

Dr. A.Gopalakrishnan is a man with a family and friends and I am sure he wishes well for them. Will he be ready to say that these dear and near ones need not ever fear radiation from nuclear plants? Would he like any of them to handle the things that are being handled at the plants by casual labour? Or else will he be prepared to resign and joins the anti nuclear group?

May be you would not be "coopted", but what guarantee is there that you could not be used or misrepresented?

In spite of all that is said above, if you feel confident that there is some possibility of opening the door, I wish you God speed.

Shri Jyotibhai Desai
Vedchhi

I was glad to note that Dr. A. Gopalakrishnan came to you on fas own for a long discussion. It proves, (I do not think you need such proofs, no Gandhian does) that there are people on both sides of any fence who do not entirely belong there and are willing to discuss issues. One's background and sources of knowledge can always differ.

Dr. Pramod Moharir
Hydrabad

Why does Anumukti not publish research articles? I am in the process of writing a review article on human chromosome anomalies and aberrations due to damage caused by radiation and drugs. I am also trying to do genotoxicity teat of some chemicals on fishes through sister chromatid differentiation.

Dr. Ashok Barat
Allahbad

The reason Anumukti does not publish unadulterated research articles is because "genotoxicity due to sister chromatid differentiation" is Greek for most of us including the editor. However, we would gladly publish articles which have been written with the lay public in mind.

I got your address from your article in *Sunday Observer.* It was terrifying to read about the awful state of nuclear power stations in India. Just to ape the West, we are not only ruining our culture and heritage but our life as well. Nuclear stations are a franckenstein monster and any catastrophe could lead to another Chernobyl

Dr. Amit
Jhansi

It must be some kind of a record (Guineas Book, please note) to have three issues *of Anumukti* coming out in the span of less than one month. The February/March issue did come out in March and so it seems that you have finally managed to beat the clock. Congratulations. I was happy to read about Dr. Gopalkrishnan's visit. I would like to know more about what you talked with him. I feel it is a new opening and if talks like this continue to take place, it would be in the long term national interest. If there could be a platform from where both sides could place their Arguments as happened in Bangalore '88, that would be an important step forward.

Vinayak Dave
Gandhinagar

The pronudear side took such a beating in Bangalore, that they have forsworn any repetition. The antinukes are always prepared to meet the nukes for an open public debate any time any place.

Since you have asked for suggestions. I am taking the liberty to pen my thought. It may not be possible to incorporate everything that I say, but the points do require your attention.

- Please give small snippets which Are interesting, informative and appealing along with long articles.
- Opinions of well known scholars in support of the articles should also be presented.
- References to the facts and figures used in articles would be very useful.
- A cost-benefit analysis of big projects against small ones should be given.

Chandmalji Kanstva
Gandhinagar

RAPP (Rajasthan Atomic Power Plant) authorities had organised an ofT-site emergency preparedness drill on December 22nd, 1993. We had organised a protest for the occasion and reiterated our demand for a referral hospital at Rawatbhata The local administration gave us good support and even the Rajasthan state government put pressure on RAPP authorities. RAPP authorities have finally conceded our demand and given a building to host the referral hospital which will be run by the state government. There will be six doctors And 30 beds. The hospital has already begun functioning and these is some relief to the poor. In support for our demand we did cite the case of Kakrapar, where the nuclear authorities have fnven money to local educational and medical facilities, but it had fallen on deaf ears without pressure from tho public. The RAPP administration still continues in its effoits to hinder useful social work by instigating some greedy local people.

Hatanlal Gupta
Rawatbhata

I had been busy with the anti-Dunkal campaign in Delhi and hence could not write to you earlier. What has been the response from Rawatbhata? Only A few people would be influenced by the RAPP Authorities' public relation campaigns. If the work of awareness raising and organisation work continues unabated then people would realise their hitherto hidden united strength and greater pressure would he put on RAPP authorities, feel that in talks with Dr. Gopalak rishnan, A few local residents from Rawatbhata should remain present and at least some portion of the talks should take place in Hindi or arrangements should be made regarding simultaneous translations. I also feel further surveys should be conducted in the neighbourhood of Rawatbhata and the true position regarding health should be firmly established. We would like to be part of this survey team.

Sunil
Kesla

A Ray off Hope From Pakistan

Just before going to the press we received this letter from Dr. Zia Mian in Islamabad. I was thrilled with it, since it is the first time in many years of effort that we have received a communication from across the border which expresses the hopes of all peace loving people of the subcontinent lam sure that there are many who would love to reciprocate the sentiments expressed in this letter and I would urge them\o do so, not only in Anumukti but also in mainstream press. Dr. Zia Mian sent cuttings of five articles of his which added to my astonishment It was a revelation for me to realise that contrary to my impression the mainstream press in Pakistan is 'free'. I have yet to see such a forthright condemnation of the nuclear madness in any of the large newspapers in India. Due to lack of space we are not republishing a full article in this issue but we have an exerpts on page .

Dear Friend,

I am writing to you as part of an attempt to establish a dialogue on peace in South Asia. I am currently researching and writing on peace and security in South Asia as a visiting fellow at the Sustainable Development Policy Institute, in Islamabad. I also write a column in The News, a major English Language paper published in Islamabad, Lahore, and Karachi. I hope that after this letter you will wish to open up a line of communication between your organisation and 8DPI, as part of our contribution to this dialogue. Let me explain the motivation.

I believe that there are sizable minorities in India and Pakistan for whom the nuclear arms race between our countries is a symptom of a deeper malaise. It is this that needs to be tackled, but the issue of nuclear disarmament in the region can, in fact, help us address this. The important thing is for groups in India and Pakistan to make common demands, but to make them to their respective states, and to couch them in unilateral terms. For example, Pakistani groups should demand that their government give up the nuclear weapons programme, and be able to point to Indian groups that are making the same demand of their government. But both sets of groups should not accept a position that we will give up our programme, if you give up yours". It is these demands that need to be worked on together.

For me a crucial problem is the absence of information about the peace movement in India. Since I know how difficult it is to follow the debate on this issue in India, from Pakistan, and I presume it is almost as difficult for you to get access to the Pakistani media, I enclose a copy of some of my articles that have appeared in the press in Pakistan. I would be grateful for any material you may be able to send me.

Dr. Zia Mian
Sustainable Development Policy Institute
P.O.Box2342
Islamabad, Pakistan

Subscription Information

Rs. 30/- per year (6 issues) within India
U.S. $ 15/-per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the Stale Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/- Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi 394 641 India
Tel: 02625-2074

Please do not send personal cheques or drafts addressed to Surendra Gadekar

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published by S Gadekar for Sampooma Kranti Vidyalaya and printed at The Parijat printry Ahmedabad

PRINTED BOOKS

ANUMUKTI

A Journal Devoted fo Non—Nuclear India

Volume 7 Number 6 June / July 1994

Floodwaters Drown Kakrapar

First there was fire. Now Water. The turbine building at Kakrapar atomic power station which was gutted in a devastating fire on 15th September, 1991, has now again suffered extensive damage due to floods.. Equipment worth crores of rupees has been devastated and the station is not expected to start functioning again for months. A Chernobyl-like catastrophe was averted only because as luck would have it the plant was in a shut-down state at the time.

The monsoon arrived in South Gujarat with a bang. There had been a few preliminary showers from June 10th onwards but nothing had prepared the population for the fury that was unleashed on June 15th and 16th. The rain continued steadily for hours together during which about 25 to 42 centimetres of rainfall was recorded in different talukas of Surat district. All the rivers and small streams of the area were in spate rising by metres within a few hours. Fortunately the rain stopped by the evening of June 16th and the waters started receding.

The scene they left behind was one of utter devastation. A thousand houses were demolished in Bardoli alone and many more elsewhere were damaged. Whole sections of roads, railway lines and bridges vanished into oblivion. Trees were laid low and farms turned into ponds. We (Sanghamitra and Surendra) were caught 100 kms from home and had to trudge back through rivers and streams and making long detours.

River Tapti runs east to west north of Kakrapar nuclear power station. There is a dam on the river at Ukai about 25 kms east of the plant and a weir at Kakrapar which is just one kilometre north of the plant. Just behind the turbine building there is the Moticher lake which has a gate to control flows at Ratania. The outlet ducts of the turbine building connect it to the Moticher lake.

As the rain poured on, the level of the water in the lake started to rise. By night fall on the 15th, it had risen sufficiently that the water started flowing from the lake towards the turbine building. The engineers on duty at the time took no remedial action. By the next morning the water had filled the underground room containing pumps, motors, cables, etc. which feed the boilers and are necessary for the regular recirculation of steam from the turbine to the steam generating section in the reactor building. Floodwaters had also spread to other sections of the reactor complex including the offices of the project director and the chief project engineer, the master planning group, the field engineering section, the Civil Job Section amongst others. The reactor building was mercifully spared. Computers by the dozen and hundreds of papers and flies were soaked in the slush. There was more than five feet of water near the main entrance and the workers of the morning shift had to swim inside. All the large storm drains in the area failed.

It was only by 11 O'clock, 16th morning that the authorities woke up and began remedial action. A site emergency was declared and all non-essential workers were evacuated from the reactor site. Other measures consisted of act ivating external pumps to drain the buildings and making efforts to get civil authorities to order the opening of the Ratania Gate so that the level of water in the Moticher lake could begin to fall. It was only on the 18th morning, after the waters had receded completely, traffic had resumed on the roads and a large pump was brought from Tarapur, that some success was achieved.

Unit-l of Kakrapar had been on a planned 72 day shutdown from 5th February, 1994. The plan was to check and replace the faulty turbine blades which had been the cause of the fire in the turbine room in Narora lastyear. (See Anumukti Volume 6 Number 6 June / July 1993.) It is worth recalling that at the time the chairman of the Department of Atomic Energy, Dr R Chidambaram, had claimed that the Narora plant would be operational within four months at the most. It is now 14 months with no sign of that happening. The shutdown at Kakrapar too had stretched beyond schedule and the unit was supposed to recommence generation on the 15th of June. Fortunately it didn't. If the unit would have been operational and producing steam, then a flooding of the pumps would have resulted in steam being pushed back into the reactor building causing overpressurisation and a large explosion as at Chernobyl.

Work on Unit—2 of Kakrapar has been proceeding rapidly and the authorities have been rather anxious that it becomes operational this year. (Just three years behind schedule.) Hopefully, the flood waters have drowned these aspirations.

The floods have once again demonstrated rather vividly the total failure of planning and the inadequacy of the administration in dealing with a nuclear emergency. Since the roads had been badly damaged due to floods, it was difficult for anybody to even get to the reactor site. If there had been an off-site emergency, the authorities would have failed to evacuate even themselves leave alone the population. Even now, five days after the event, the civic authorities have not been able to provide relief to affected villages in the vicinity.

South Gujarat is fortunate that unlike other areas of Giyarat, the rain gods still smile on it. Hopefully they would continue to do so every year. But even moderate rain today can cause havoc. 'Development' has meant large scale deforestation and the blocking of the natural drainage by roads, canals, railway lines and other constructions. Another large contributor to this has been the 'levelling* of agricultural fields. The natural systems which provided protection earlier have perished.

Rains, floods, cyclones, earth' quakes are 'natural' events. Planning for the nuclear plant should have taken all such factors into account. The floods have demonstrated the incompetence of the nuclear planners in a very striking manner. They are the people who cannot even design storm-drains properly Can the people continue to trust these 'experts'?

Surendra Gadekar

From the

How Many More Warnings Before the Final Curtain?

Just before a catastrophic volcanic explosion, there are many signs of increased volcanic activity. There are greater lava flows and more smoke and gasses from the cone, the frequency of small earthquakes increases perceptibly, etc. Examples abound of those who ignore these warnings and continue their business as usual lifestyle, ending up as victims of volcanic eruptions. Pompeii is a reminder of what happens to those who continue to sleep till it is too late.

Accidents in the nuclear jargon are called 'unusual incidents'. The Indian nuclear programme is so accident prone and mishaps so frequent, that to call an accident unusual is a distortion of truth. They are, however, most peculiar. Where else in the world would one find the massive steel and concrete containment building collapsing on its own like a house of cards.

One thing we can always be sure of. Even in times of crisis, when all others would be worried sick and unable to think coherently, nucleocrats would be calmly at work finding charming new words to enrich the English language. Their description this time for a 130 tonne chunk of concrete falling is 'delamination'.

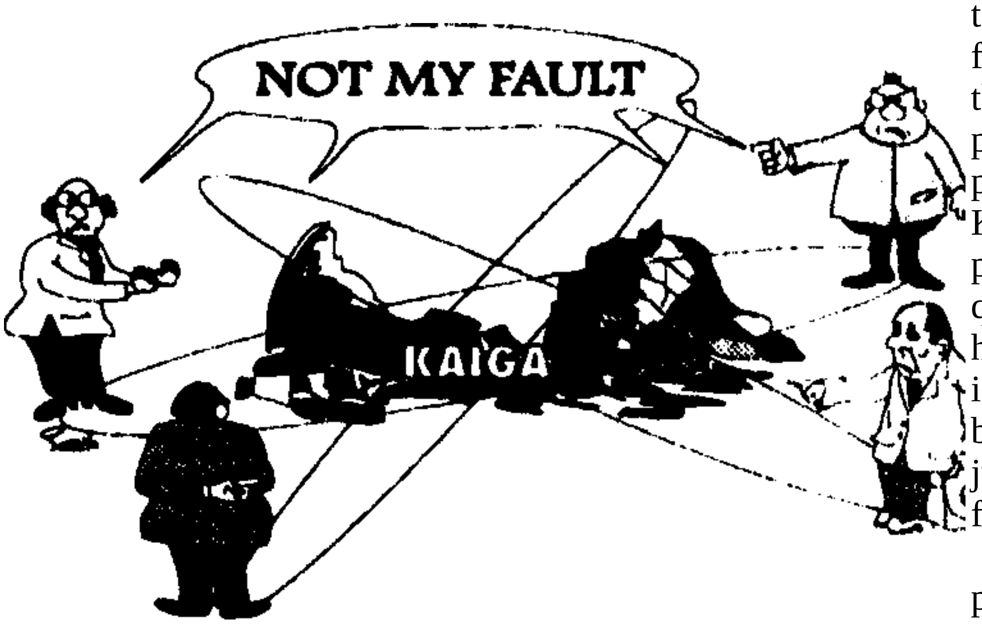
In 1988, hundreds of women of Karnataka, under the leadership of Dr Kusuma had 'raided' Kaiga and brought construction work to a halt by jumping into the foundations. Unfortunately, the momentum of those inspiring days has been frittered away and the Kaiga movement today is in a state of coma. The same inertia grips the antinuclear movement everywhere. It is high time that we heed the warnings of the nuclear volcano. Unless we put an end to our indulgence towards this insanity we are bound to suffer the sorry fate of victims of nuclear violence.

A Double Wall off Deceit and Disinformation

The bizarre mishap at Kaiga during which a portion of the dome crashed down is a matter of utmost concern. The lives of thousands of innocent citizens around our nuclear reactors depend on the integrity of the containment structures. We have been solemnly assured by our nucleocrats that the containment structures provided by them are the safest, capable of withstanding earthquakes of the order of 6.5 on the Richter scale, or a bomb attack by an enemy warplane. Even if the reactor were to explode like a bomb, as has happened in Chernobyl, the integrity of the dome and the safety of the people will not be compromised. They are supposed to be designed and built to contain the radiation from the reactor under all adverse circumstances throughout the life of the plant.

And yet, within four months of its construction, the containment structure of Kaiga has come crashing down under its own weight, without any external influence whatever. If such a mishap were to occur with the reactor in operation, the consequences would be devastating. The steel and concrete debris of the collapsing dome would damage the core and leave it exposed like a smouldering radioactive volcano. The entire population of Uttar Kannada and Goa will be in danger and will require immediate evacuation. Neither the government of India nor the Atomic Energy establishment is in any way equipped to handle a disaster of such magnitude.

The exact reason for the ,mishap **at Kaiga is not yet known. Whether it is poor design, substandard materials or defective workmanship** or **a combination of** all **the three is to be established. What is the extent of corruption in the project ? Are safety norms being thrown to winds** so **that the project is somehow completed in time ? The people have a right to know the answers since it is a matter of life and death.**



The Nuclear Community Speaks in One Voice

Unfortunately our nuclear establishment is not answerable to anyone — the people or the Parliament. For decades they have been conducting their covert operations behind a double wall of deceit and misinformation. Every effort will now be made by them to suppress the serious nature of the Kaiga accident and pass it of as 'minor' and 'inconsequential'. Till date they have not disclosed the true extent of the damage or the number of casualties. Injured workers have been kept in custody and are not allowed to meet anyone.

We demand a comprehensive inquiry into the causes of this moat serious accident, by a team of independent experts who will not be influenced by the nuclear establishment. We reiterate our stand **against the** folly of setting up nuclear **power plants** anywhere, especially in ecological sensitive areas like **Kaiga.** Such shoddily built power plants pose a grave danger for the environment and the public. Despite all the money already wasted on it, there can be no justification for continuing the project at Kaiga. We urge the Government of Karnataka to take the initiative and place before the people, all the details of the present and the past accidents at Kaiga and their possible consequences on public health. Let a well informed citizenry be the ultimate judge of the need for such projects.

Already several politicians at the local and state level have voiced their opposition to the continuance of the Kaiga project. In an election year, it is natural for those in politics to define their attitude according to the voters' moods. Our opposition to Kaiga has always been purely on environmental and developmental principles. We sincerely urge everyone, including the political parties, to take a firm, principled stand and stick to it even after the elections.

Sanjay Havanur
Co-ordinator CANE, Bangalore

The Dome off Death

Trust the nucleocrats to come up with something truly bizarre. For years we have been bombarded with tall claims of the superiority of our double containment structures. They are supposed to withstand the worst of nature's furies. I remember a leading nucleocrat claiming that in the event of an earthquake the safest place to run for shelter would be your neighbour reactor building since it is built to withstand jolts of 6.5 magnitude on the Richter scale. They can survive bomb attacks - either by terrorists or by enemy warplanes. Above all they must withstand the internal stresses from the reactor core itself, including the tremendous pressures built under loss of coolant accident conditions.

No problem, say the nucleocrats. We have double containment structures you see. They form the fifth barrier against the radiation escaping from the core. "The containment provisions are proof tested to establish beyond any reasonable doubt that they are capable of withstanding the pressures that are expected in the case of an accident." A Chernobyl type of disaster, where the reactor core was totally exposed to the environment, just cannot happen in India. We have not just one but two containments so we should feel doubly safe.

But not quite. The term 'double containment structure[1] implies a 100% redundancy in protection which simply is not there. The first containment is a 300 mm thick wall of pre-stressed concrete designed to contain a pressure of 1.25 kg/sq. cm. But the second containment is a much thinner wall of RCC designed to hold against only 0.07 kg/sq. cm of inner pressure. In other words, it is designed to contain the gases leaking out of the first dome. If in an accident, the inner containment were to be breached altogether, the outer one would automatically cave in, exposing the core.

There has been a long and unresolved international debate as to whether reactor containments can really hold out against a LOCA. For one thing the actual stress on the dome in an accident has obviously never been measured. Given the complexity of the problem, one has to rely entirely on computer simulations for the answers. But these answers are only as reliable as the model used for the simulation which again is supplied by the nuclear scientists. Our own nucleocrats, true to their style, have never disclosed any meaningful information on reactor safety except for banal assurances of 'highest degree of safety' and 'defence in depth'. The antinukes have had their doubts about the integrity of the containment structures but kept their dark suspicions to themselves.

But what happened at Kaiga has been beyond their wildest suspicions. How could anyone have ever doubted the ability of a reactor containment, even the one being built by NPC of India, to withstand its own weight? On the afternoon of Friday the 13th (touch wood!) May, a massive slab of the inner containment of Reactor I detached from the dome and crashed. The earlier reports said that only one slab about 6.5 meters wide and weighing 20 tons had fallen. But the more recent reports suggest that nearly *40%* of the inner portion weighing a massive 130 tons have got 'delaminated'. The dome was completed last January but plumbing, cabling and other works were going on. Both NPC and AERB have set-up separate committees to investigate the mishap. The AERB committee, under the chairmanship of a rather inappropriately named Professor V N Gupchup, has been asked to submit its 'first interim report' within two months. The committee will also decide whether the fallen dome can be repaired or has to be rebuilt entirely

But the real and the most frightening issue is not accident itself but what it implies., The consequences of such a mishap inside a working reactor would be nothing short of nuclear catastrophe. In the worst case scenario, the falling debris of a shoddily built dome would damage the coolant pipes and other safety mechanisms. The core would suffer a loss of coolant with all safety mechanisms unavailable. With the containment roof having caved in, the core would be fully exposed to the environment like a smouldering radioactive volcano. It would be another Chernobyl and given the sheer incompetence with which our official machinery handles an emergency, the immediate death toll could well be in hundreds of thousands.

The AERB on its part has already issued directives to halt the construction work not only at Kaiga but also at RAPS III and IV. But the NPC seems more adept at splitting hairs rather than its atoms. The directive has been interpreted to cover only the civil construction of the inner containment. All other construction work at Kaiga will continue. However, there is another major threat to public safety that AERB has not recognised. The Kakrapar reactor has also been completed in a desperate hurry and with total disregard for safety. It has gone critical without adequate testing of basic safety systems. What guarantee do we have for the integrity of its containment? AERB must immediately order for the closure of Kakrapar and make a thorough investigation of all its safety mechanisms, including that

I KNOW THERE ARE HARDLVANV TREES LEFT IN THIS RAINFOREST RUT YOU STILL CANNOT SIT ON NUCLEAR PLANTS
KAIGA

of the containment structures. With thousands of lives at stake, we simply cannot afford to take any chances with these domes of death.

A number of theories have been proposed to explain the Kaiga mishap. The most far fetched one is that a geological fault passes right through reactor foundation. It might have thrown up a mild tremor, not' strong enough to be recorded any where but sufficient to cause the collapse of the dome. If this is true, it only vindicates the environmentalists' arguments against the site selection. But the more plausible causes are faulty construction methods and sub standard materials, not withstanding the righteous claims of NPC about using only tested, materials of the highest quality. The nuclear establishment's culture of secrecy and absence of accountability leads invariably to corruption. It has been alleged that the markets of Uttara Kannada are now flush with high quality cement, steel and other construction materials. Sometime ago the roof of the fire station building at the site too had collapsed when a conventional structure of cement in a Government project collapses immediately after it is built, the reasons are quite obvious; A local was put it neatly when he said that the contractors will collect their bills but leave behind a Chernobyl!

Having been severely criticised for the 300% overruns in cost and time incurred in all of its projects, the nuclear establishment has been hell bent on completing the Kaiga project on schedule at any cost. The question is whether safety concerns have been thrown to the winds in the process. It is already established that the actual construction done at the site was different from the plans submitted to and approved by AKRB. Also, several processes such as stressing sequence for the concrete were carried out without AERB's approval. Were the engineers at site authorised to make design changes? Were they competent to do so? If not, do we understand that the designs of our atomic power plants are subject to incompetent and/or unauthorised changes at site?

Immediately after the accident, the NPC officials closed the reactor building and barred entry. However, a team of women activists, led by the intrepid Dr Kusuma Sorab, visited Kaiga late in the night and spent some time with the labourers who live in sub human conditions around the site. They are a frustrated lot and accuse the contractors at site of all kinds of malpractices in construction. They also claim that there have been other accidents at Kaiga involving casual workers. Compensations have been promised but never paid.

There is one aspect of the mishap that still remains shrouded in mystery. How is it that no fatalities have been admitted by NPC? Officially only 14 workers working above the dome suffered minor injuries. Only one of them is still in hospital, under strict police custody. The explanation given by Mr B. A. S. Prasad, chief Administrative officer is that the mishap occurred during lunch time and hence no one was inside the dome. The coincidence apparently has reaffirmed Mr Prasad's faith in God. But lunch hour at 11-45 AM at a construction site is too hard to swallow. Besides, what were those fourteen people doing on top of the dome during lunch hour? One of the workers, who was on the dome has little faith in Mr Prasad or God. According to him, at any given time there are at least 200 people working inside the reactor building. When the inner wall of the containment began to fall, a lot of dust was kicked up and no one could see anything. The local police were informed of the accident only late in the night. All this leads inevitably to a disturbing question. Has Kaiga already claimed its first human victims?

Sanjay Havanur
Bangalore

Only Public Action Can Ensure Safety

he latest disclosures by the Atomic Energy Regulatory Board about the May 13 accident at the Kaiga atomic power project should make us all sit up On that day, a huge slab of concrete from the under-surface of the containment dome of Unit-1 of the plant, weighting 130 tonnes and with a diameter of 42.6 metres came crashing down.

According to spot reports, about 200 workers were inside the building. Miraculously — going by the Nuclear Power Corporation's account, that is —only 14 of them were injured. The public's suspicion that the damage might have been greater have not been assuaged by the fact that the iiyured workers are in police custody and incommunicado.

Only a full inquiry will, hopefully, fix responsibility for the accident. But meanwhile, the mishap has blown a big hole into the department of atomic energy's (DAE) claim that the containment dome, part of the essential safety systems at nuclear power stations, is itself a safe structure, reliably designed to withstand earthquakes of magnitude 6.5 on the Richter scale (about the same as Latur), or aerial bomb attacks.

Principal Barrier

Theoretically, the containment dome is, as the name suggests, meant to contain releases of radioactivity from the reactor it encloses. It is the principal barrier between vast quantities of radioactivity liable to be released in a mishap, and the public. In practice, it does not work that way: at Chernobyl, for instance, the force of nuclear explosion was 90 times greater than the level the dome was designed for.

Kaiga highlights the sinister possibility of the containment dome causing rather than containing a nuclear accident: had the plant been working "normally" when the mishap occurred, nothing could have prevented a catastrophic accident even a core 'meltdown'.

The possibility does not look lees menacing when the AERB reveals that reputed firms such as Larsen & Tbubro and STUP Construction of France were involved as builders and consultants of Kaiga. Indeed, according to the AERB, they made a major, unsanctioned alteration of the construction design, perhaps to speed up work, changing from construction joints at the circumference to "meridinal construction joints".

It is not known if STUP made these changes with NPC's knowledge. But it is clear that the accident could not have occurred without a departure from sound working practices and safety codes and a lackadaisical, if not reckless, attitude to safety. This is not unique to Kaiga, but widespread at Tarapur and Rajasthan - where hundreds of workers have been exposed to excessive doses of radiation, as this paper disclosed-Narora, where a devastating fire occurred in March 1993, or at the Indian Rare Earths plant at Alwaye where there is a horrifyingly high incidence of Down's Syndrome among the children at DAE installations is scarcely reassuring and certainly no better than in industry, in general. But the consequences of a breach of nuclear safety norms are disproportionately greater, indeed enormous.

Special Category

It won't do to dismiss the Kaiga accident as inconsequential or something that the system can somehow deal with. It belongs to a special category of worrisome accidents in a high-hazard industry, discussed by the Yale sociologist Charles Perrow in his remarkable book, *The Normal Accident.* It confirms the worst fears of activists who have been agitating against the Kaiga plant for almost a decade.

Here lies a lesson, the AERB is just not good enough to do the job of regulating the DAE for safety It needs more teeth, more expertise, more demanding inspectors and more punitive powers and, above all, full autonomy.

Only an AERB which is detached from the DAE and reconstituted to include independent experts and concerned citizens can satisfy two elementary ethical requirements, viz., those who regulate, supervise or judge should, operate and hence may be in the dock; and, secondly, that people who are liable to be affected if a development project fails must be associated in deciding on its desirability, its operating practices and safety '

Now this is precisely what we have failed to do in India. We have invested heavily in activities with potentially harmful consequences for the public without bothering to create mechanisms to regulate them, or to deter and punish violations of safety standards. And we have blindly relied on "experts"the scientific bureaucracy, to make decisions about true worth of large dams, flyovers, chemical plants or pesticides-intensive agriculture. Often, our political leaders are more open to issues of technology and its hazards than our scientocrats and "experts". The "experts" are Usually too smug, dogmatic and closed in their attitudes to want to engage in serious, open debate.

However, a larger leeson is that even political leaden cannot be trusted to be objective, informed and fair-minded. The only remedy lies in public action. There is simply no substitute for involving the public - the ultimate criterion of benefit, and also the potential bearer of the cost- in the evaluation, clearance and supervision of projects, stipulation of safety standards, and hazard reduction and disaster management. The US has a system of public hearings on dams. The idea must be enriched and extended to all large projects in this country.

***Prafut** Bidwai*
Times of India June 2. 1994

National Profile off X-ray doses

Two years from now, India will be among the few countries in the world to have a national profile of X-ray doses, according to the Atomic Energy Regulatory Board which has embarked on an ambitious research project to gather exhaustive data on radiation doses to patients undergoing X-ray examination in thousands of hospitals and polyclinics spread across the country.

Medical X-rays were first used in India within three years of their discovery. The rays were brought by the Indian Army to the North-West Frontier Province and used effectively by Surgeon Major Bewoor. Following his success, base hospitals in England were later equipped with the diagnostic and therapeutic tool As per latest estimate, about 81 million medical X-ray exposures are taken annually in India, using 50,000 X-ray units operated nationwide. Nearly 1,500 new units are added annually.

Eleven scientific institutions including the Institute of Nuclear Medicine Delhi; Christian Medical College, Vellore; Kidwai Memorial Institute of Oncology, Bangalore; RST Cancer Hospital Nagpur and Irwin Group of Hospitals, Jamnagar have been involved in the project titled "Evaluation of Patient Organ Doses during Diagnostic Radiology."

"Radiology officers will visit all the X-ray centres in the country to collect the data on a proforma prepared by us which will later be fed into our computer," said secretary AERB Dr. K. S. Parthasarathy

The project, first of this kind in Asia, is being undertaken following suggestions made by the International Commission on Radiation Protection that "some dose constraints must be arrived at by the regulatory body or professional organisations". According to the international body, the ranges of radiation doses in X-ray investigations were found to vary by as much as a factor of hundred. AERB's inputs will give valuable inputs in this decision making*

The AERB has sanctioned an amount of Rs. one lakh per institution for a year for the job. The collection of data which includes type of radiological exams, frequency, sex and age group will be conducted by radiological safety officers.

Hiren K Base
The Independent May 6.1994

Comment

Hiren K. Bose's report "National profile of X-ray doses" ascribing to the International Commission on Radiological Protection the statement that *"ranges of radiation doses in X-ray investigations were found to vary as much as a factor of hundred"*, if true, may have criminal negligence implications to those causing exposure to ionising radiation. A patient who should have received no more than 8.4 millirems for a chest X-ray might have been exposed to 850 millirems ! This is not a hypothetical situation but has actually happened abroad. Between 1985 and 1989, in a community called Sittensen between Bremen and Hamburg in Germany, children were overexposed to diagnostic X-rays by as much as a factor of ten which resulted in more than seven hundred percent (700%) leukaemia occurrence amongst them as compared to children of the control area (the Mainz). In the February Annual Meeting of the American Association for the Advancement of Science, a session on breast cancer included many presentations linking breast cancer with medical X-rays. At the same meeting, Dr. Samuel Epstein, a professor of medicine at the University of Illinois at Chicago, speaking at a panel session on breast cancer research policy in the USA. said that the expanding use of X-ray mammography to screen women for breast cancer in the USA, was "reckless, if not criminal". In view of this, it is not only essential to gather exhaustive data on radiation doses to patients undergoing X-ray examinations, but to follow up of the patients themselves till their death* What have been the consequences of this reckless practice on unsuspecting uninformed people? There has to be an independent watchdog body having no conflict of interest like that of the nuclear industry; supervising the data base.

R *Ashok Kumar*

Twenty Minutes That Shook BARC

India's controversial atomic energy establishment has had yet another close brush with infamy. The CIRUS research reactor at the Bhabha Atomic Research Centre was just 20 minutes away from a "major disaster" last month following a "grave procedural error".

The "incident" occurred around 11 am on April 12 when operators at CIRUS failed to connect a water pipe to a spent natural uranium fuel rod that had just been taken out from the reactor for refuelling. There were no injuries or deaths. Department of Atomic Energy sources first said the incident could have measured '2'on the International Nuclear Events Scale, just below the Narora fire incident last year which measured '3' on the same scale, but later pegged it down at level '1'.

The operating licences of the entire crew, comprising five operators including the shift in-charge, have been withdrawn for a period of six months with immediate effect following the incident.

Dr A Gopalakrishnan, chairman, Atomic Energy Regulatory Board, which monitors safety aspects in nuclear reactors, confirmed the incident, and said a committee had already been formed to do a root cause analysis of how it occurred. A report is due in three weeks time.

DAE sources said the incident was another pointer to a "safety culture problem" prevailing within the BARC where CIRUS is located. "Last month they forgot to connect a water hose. What will they do tommorow?" However, BARC Director A. N. Prasad downplayed the incident: "There is nothing so serious about what happened on April 12 so as to deserve being reported. We know how to manage such things. The AERB is there, and we are answerable to it. Just leave us alone."

When an exhausted fuel rod— that is natural uranium that has been used up by the reactor to generate power -is taken out of the reactor, it is moved to the spent fuel bay, This is done by. first moving it into a 10-feet-long cask and then transferring it into a spent fuel pond.

Usually, when the rod is removed and is being moved to the top of the cask on the way to the pond, cooling is provided, as there is still some heat in the spent fuel element. The heat is enough for radioactivity to be released into the atmosphere if it is not cooled.

"We know how to manage such things. Just leave us alone."

A. *N. Prasad Director BARC*

'I *am only hurt that people think we need policing."*

S. K. Chatterjee Director

NPC

When the rod is within the reactor, there is no such problem, as it is automatically and constantly cooled. An official in the know likened the procedure to a child in a mother's womb. "As long as the baby is inside, it does not have to wony about nourishment. But the moment it is out, it has fend for itself". But the moment the rod is taken out, the cooling is done by connecting a light water hose to the cask. But on April 12, it was not, And the discrepancy was not noticed for at least 20 minutes by which time slight radioactivity had been noticed in the precincts of the reactor. Otherwise the rod would have overheated with disastrous effects. "If another 20 minutes had lapsed, we would have had a major problem on our hands. The temperature of the spent fuel would have shot up and the rod could have ruptured spewing radioactivity within the reactor establishment," one BARC source said.

Fortunately, the reactor- which has been operating at 20 MW capacity, half its installed capacity- had been shut down, when the incident occurred. "If such an incident had taken place in a power reactor, it would have been a totally different case," the source added.

S. V. Kumar, chairman of the AERB's safety review committee of operating plants, said the point to ponder was why the operators failed to connect the water hose to the spent fuel element. He, however, agreed that it was a matter of concern that such incidents were regularly being reported from CIRUS and its sister reactor Dhruva.

However, S Shankar, who heads the BARC reactor division, said the incident was not serious. Such incidents, he added, occurred the world over in all other industries and the CIRUS one was just one such. No more.

DAE sources revealed that the cask operator had, on the other hand, reported at least four times on April 12 that the flow of water was okay, even though no water was flowing to the spent fuel element, as the water hose had not been connected at all.

CIRUS was installed in 1961 and is said to be of vintage quality.

'The point to probe is whether the flow meters which have been provided to the operators of CIRUS are in working condition or not. If they are not, then it is very likely a case of dereliction of duty." the sources felt.

CIRUS reactor superintendent R C Pant declined comment, saying it was up to the public relations wing of BARC and AERB to confirm or deny the incident, and ascertain the veracity of its magnitude.

R. K. Sehgal, an activist for greater safety at nuclear establishments, however, felt too much was being sought to be made of the April 12 incident in an effort by the DAE to whitewash its previous lethargy in dealing with more serious incidents.

"The environs of the CIRUS Dhruva complex have been contaminated for years due to rupture in a pipe carrying radioactive fluids. Yet all the people responsible for that have gone scot-free. Why?" he asked.

The five delicensed operators will not have to seek requalification when AERB conducts its review examinations six months down in the line. However, they will continue to draw their salaries.

Krishna Prasad
The Sunday Observer,
May 7, 1994

Containment: The Ultimate Barrier

Kaiga Dome Falls ... Collapses... Concern Over Kaiga Mishap.. Union Government Urged Thorough Inquiry... Matter Serious... NEWS 18th May, 1994

Of course the matter of the dome collapsing is serious. It has been the boast of Indian nucleocrats that our PHWRs - the pressurised heavy water reactors have a dome within a dome! And hence, the public can rest assured regarding safety.

At the Third International Symposium on Small and Medium Size Nuclear Reactors New Delhi August 24-25,1991, hosted by IAEA and others at least three papers devoted considerable space and time to dome design. A. K. Babar, V. Venkatraj and A. Kakodkar of BARC, in "Pressurised Heavy Water Reactor in Public Domain", state: "A comparison of core damage frequency of PHWR with that of PWRs (pressurised light water reactors) has been made and the advantages of a PHWR are explained from the viewpoint of public safety The studies show that because of the design safety characteristics of a PHWR (e.g. presence of cool moderator as a heat sink under accident conditions, calandria vault cooling system, double containment etc.) the impact of worst case accidents in the public domain is not likely to be any greater than that of the design basis 'accident'. However, just two years later D. V Gopinath, Director of health, safety and environment group at RARC won the "Never too late for Realism Award" of *Anumukti* for his statement: "Emergency situations beyond the design basis of nuclear power plants cannot be ruled out." (September 1993).

Nucleocrats frequently reassure us that containments are built carefully keeping in mind their extraordinary importance. Eabaret al state: "Because containment is the ultimate barrier in the case of an accident, particular care is exercised in containment design. The principle of double containment is used and care is exercised that this provision extends over all penetrations and leak paths. The layout considerations require a rather large containment for the PHWR. This augments safety by enabling reduction of hydrogen concentration, in the event of an accident." What is left unsaid in this is the fact that in case of fire, the explosion ratio is reached easily and quickly because of the consumption of the large volume of air confined in the dome? Remember lust year's Narora explosions!

let us look at the extraordinary faith Indian nucleocrats repose in containment as a cure all safety feature. "A large number of accident sequences have been analysed, and it has been found that as long as containment is available, there is virtually no additional impact in the public domain regardless of the accident scenario considered. It has also been established that there is no possibility of a threat to containment integrity. Similar conclusions have been reached for similar reactors abroad. It must be mentioned here that some of the sequences considered in the above study include failure to effect a prompt shutdown following a LOCA (loss of coolant accident). Such a sequence is highly improbable. Further, based on a study of the consequences of this accident sequence and considering the resulting metal water reaction, hydrogen generation and energy liberated, it is observed that the impact in the public domain is not greater than that already considered for the design basts accident. This is so because, even though the release from the core would be more *assuming the availability of the containment, the impact would be confined within the exclusion radius (1.6 km). This brings out the important role played by the containment and validates the importance attached by designers to the evolution of a sound indigenous containment design for PHWRs, so that it effectively limits the consequences even when the entire inventoty of 1-131 and noble gases is assumed to be released from the core."*

Another paper "Distinctive Safety Aspects of Small and Medium Sized Nuclear Power Plants in India", by M. Das and L. G. K. Murty, Nuclear Power Corporation, India talks of *"a double containment that exhibits a forgiving behaviour under hypothetical overpressure conditions"* and says it contributes to a design which would ensure that severe accident probability is Very low' and *'even if it were to happen, it can be fully contained*.* Again: *"the containments are built sufficiently strong to tate care of LOCA and seismic events occurring simultaneously".*

And yet, the dome just collapsed! The big chunk of concrete dropped down from a height of about 40 meters, says the news report. Despite the fact according to locally stationed engineers that "building activity has been subject to stringent quality control".

Another paper devoted especially to the reactor building structure in the New Delhi symposium referred to above, "Design Strategy of New 235 MWe Indian PHWR Reactor Building Structure", by PC Basu, Head Civil Engineering Section, AERB, A Dasgupta, Chief Engineer (civil and structural), Development Consultants Ltd., Calcutta, and HN Batavyal, Executive Director Development Consultants Ltd., Calcutta, attempts to delineate how the safety objectives in the 'new' design of reactor building structural systems for PHWRs in India are fulfilled: 'Systematic method for handling both internal and external hazards generated due to man-induced and natural events in the design is presented.' The paper especially mentions that the design takes care of internal hazards which are listed as fire, internal missiles, failure off pressure parts, 'pipe whip' and jet impingement, blast effects and compartment pressurisation, internal flood, heating and condensation, dropped load, explosive gases and impact during construction. Further it mentions that *impact during construction and dropped load hazards are avoided by proper administrative control and control in the system design.*

"The configuration of internal structure is so developed that the structural elements which invite more stringent design criteria is protected, to the extent possible, from the internal hazards by the structural elements wliose design criteria are relatively less stringent."

According to the paper the design approach is as follows: "Two classes of uncertainties—primary and secondary are dealt with. The primary uncertainties are associated with system uncertainties while secondary uncertainties are introduced in the design due to the limitation of data and knowledge (what are they?) of different aspects of design procedure and the state of the art. (In other words in nuclear reactor systems where no acts of the devil are permitted, they admit precisely this is possible, because of the fact that nuclear design is immature). They state: *"The dispcuity between the predicted behaviour of the analytical model and the actual behaviour of the structure introduce secondary uncertainties and this reduces the confidence in design."* Perhaps herein lies the real explanation of the Kaiga dome collapse.

They continue: "The primary uncertainties may be taken care of using characteristic values considering the randomness of the design variables like load, material properties, etc." This calls for probabilistic design approach of structures. However, experience shows that structural design in deterministic format following 'certain guidelines' also guarantees reliability in design. The deterministic methodology are adopted to design for structural integrity and serviceability. The secondary uncertainties are minimised to the extent possible. For this purpose the configuration of structural systems requires that the available proven analytical tools are applicable with high degree of confidence. However, all the design uncertainties cannot be addressed through analytical design. The remaining ones are to be taken care of by a systematic quality assurance programme.

"The approach to hazard in design and the concern for minimising secondary uncertainties are kept in mind during ail stages of engineering i.e. siting, conceptual development, structural- layout, analytical design, and construction, the above activities are not independent but are inter -dependent, therefore, design strategy adopted must be such that the total safety is ensured through all these stages."

The above description makes it amply clear to the layman that there indeed may be an infinite number of slips between the cup and the lip, concretely, for a change! Well, that is just the unforgiving nuclear technology.

R. Ashok Kumar
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Some Lessons in Nvcleonomics

Recently I have been reading Nucleonics Week, a nuclear industry journal. Below are some excerpts from it and other journals. Read together they give a picture of the financial state of the nuclear industry today. They also shed some light on the alliance between Third World bureaucrxUs and First World corporate tycoons.

Lesson Number 1: Nuclear power plants are three times more expensive to build as compared to nucleocrats' claims.

The Parliamentary Committee on Energy in its report to parliament has criticised the long delays in completing new nuclear power plants that have led to cost overruns exceeding 300%.

The Kakrapar Atomic Power Projects two 220-MW pressurised heavy water reactors (PHWRs) using natural uranium fuel- was originally estimated to cost Rs 3.8252 billion but the cost has been revised to Rs-13,35-billion. The first unit began operating in May 1993 and the second is expected to go critical later this year. The fiscal 1994 federal budget (through March 1995) provides some Rs 400-million (about $12.9-million) for the project.

The Rajasthan Atomic Power Projects third and forth 220-MW PHWRs were estimated to cost Rs 7.1157-billion, but the estimate has now shot up to Rs 21.07-billion. The Kaiga Atomic Power Projects' two units, also 220-MW PHWRs, was approved at a cost of Rs 7.3072 billion, in 1987 but is now expected to run over Rs 22.76 billion.

"The committee feels that the loos of benefits to the economy owing to time and cost overruns of projects cannot be overestimated," the report said, hoping the Nuclear Power Corporation, of India (NPC) will at least now stick to the revised schedule of completing the work.

The Department of Atomic Energy (DAE) has cited the rising prices and changes in the scope of mqjor activities as the main reasons for the steep cost hikes. The original estimates provided for only a 15% rise in costs, while the scope of work in each of the projects has increased due to what the DAE termed "the evolving safety requirements and continued technology evolution to conform to prevalent safety standards." Kakrapar-1 was originally scheduled to operate in December 1990. Rajasthan-3 and -4 were to be commissioned in May and November 1995, respectively, and Kaiga-1 and-2, in June and Deoember, 1995. The revised schedule hopes to have all four ready by March 1997.

The FY-94/95 budget provides some Rs 2.9518 billion for the nuclear power projects still under the governments direct control like the Rajasthan station, fuel inventory, waste management facilities at Tarapur and Kalpakkam, and Heavy Water Pool management. About Rs. 11.83 billion is provided for new power projects being implemented and planned by the NPC, which now functions as an autonomous compaity

The budget allocates R.4.13-billion for Kaiga and Rs 3.53-btllion for the new Rajasthan units. Tarapur-3 and 4, whose approved cost is Rs 24.27-billion, will get Rs 2.46-billion during FY-94/95 compared with Rs 600-million in FY-93/94. The Tarapur units are to be 500-MW PHWRs. Reporting on the progress of Tarapur, the DAE said the final award for acquisition of land has been issued. Most of the components for one unit have beon received- During 1994-95, civil works contracts are expected to be awarded and preliminary work will commence. The two units are scheduled to be completed by the turn of the century.

Neel Potri, Nucleonics Week,
April 28, 1994

The Same Story Across The World

A report prepared by the Federal Audit Court of Brazil contends that the cost actually incurred in building Angra-2 nuclear power plant are way above those released to the public. According to the utility Furnas Centra is Eletricas SA, the total cost so far for Angra-2 has been roughly $ 4.6 billion and an additional $1.5 billion is needed over the next five years to finish the project in 1999, Half the new money is expected to be financed by German banks (the pro ject is German assisted and the construction is by Siemens). However, the Federal Audit Court says that Angra-2 has actually cost $6 billion during 15 years of construction so far, excluding financing, and the auditors estimated that $2.3 billion will have to be spent to complete the plant. Since financing of Angra-1 amounted to approximately 40 % of the nominal construction costs, the auditors put the total costs including financing of Angra-2 at well over $10 billion.

"lb Furnas it does not make any difference to construct a hydroelectrie plant or a nuclear plant, seeing that the government subsidises the cost of nuclear energy," wrote an auditor in reference to the Brazilian law which subsidises Angra«l. A proposed law granting a similar subsidy for Angra-2 is currently in Brazil's lower house. If the bill passes, Furnas' financial participation in constructing Angra-2 will be limited to the cost of a hydroelectric plant of comparable size.

'This means an investment of only $1*2 billion for the utility, whereas the difference of $6.1 billion will have to be absorbed by the taxpayers, in addition to the financial cost of the enterprise," said Rui De Goes, head of the local Greenpeace organization. 'This is the first time that the account of Angra-2 are out in the opun," enthused Goes, who said Greenpeace will request suspension of all work at Angra-2.

The conclusion of the audit with respect to Angra-1 are no less devastating. The auditors calculated a total construction cost of $3.9 billion and affirmed that this amount "represents a new level for the analysis of the cost profit relationship of Angra-1." In a September 1993 report, Furnas admitted a total cost of $2,375 billion, including $752 million in financing.

Armin Schmid
Nucleonics Week April 21. 1994

Lesson Number 2: Even The Best Plants Are Just Too Expensive To Operate.

The California Division of Ratepayer Advocates (DRA) has recommended that Southern California Edison's San Onofre-2 and 3 reactors be permanently closed by 1998. The DRA, a division of the Public Utilities Commission, is the same agency that recommended shutdown of San Onofre-1 a few yeare **ago, which resulted in its closure in 1992.**

According to the DRA, a shutdown by 1998 of San Onofre-2 and -3 would result in a savings to California ratepayers of more than $1 Billion over the life of the reactors compared to available alternative energy sources.

The DRA analysis even admits that the two San Onofre reactors have been among the industry's top performers in terms of capacity and costs. But, says DRA, existing bids from independent generators (QFs, or qualifying facilities) can ensure electricity production at a lower cost than simply operating San Onofre.

California finds that Its best run plants with plant load factors of more than 80% are "uneconomical" compared to alternatives.

How come Indian nuclear plants which cost three times their estimate to build and have plant load factors ranging between 20% and 60% are economical?

The DRA analysis does not take into account serious safety issues, such as the likelihood that during its lifetime San Onofre, a Westinghouse-designed plant, will have to replace or repair its steam generators, or remove and replace its fire barrier.

Instead, the DRA analysed only SCE's own anticipated operating and maintenance costs to come up with its conclusion that it is simply not economical to operate these reactors any more.

The DRA argued that not only are the QFs cheaper than the nuclear plants, but so are the utility's own demand-side management measuras. Indeed, DRA could not find a scenario in which the nuclear plants are cheaper than the alternatives, even in the unlikely event that the reactors run at above 80% capacity for the rest of their license period.

In short, using hard numbers and southern California's particular situation, the DRA cannot imagine the possibility that nuclear reactors could be economical.

If the DRA proves successful in its effort to protect California ratepayers, as it was in promoting the shutdown of San Onofre-1, the shock waves will be felt throughout the nuclear industry After years of defending cost overruns, unanticipated capital costs and so forth, in the hopes that simply operating reactors would prove cheaper than alternatives, utility executives could be called on the mat to demonstrate why they shouldn't close their nuclear reactors, simply because the operating and maintenance costs are too expensive. As reactors continue to age and face higher and higher maintenance costs, this appears a likely scenario. In the end, if San Onofre-2 and -3 are found uneconomical, it is difficult to imagine any reactor, which undergoes the same sort of rigorous cost-benefit analysis, that could be found economical. Once again, California may be leading the nation.

The Nuclear Monitor
May 9.1994

Lesson Number 3: The Costs of Decommissioning Reactors are Deliberately Underestimated

The Canadian Auditor-General is sharply critical of Atomic Energy of Canada Ltd (AECL) for failing to provide for expected costs of decommissioning facilities and restoring research station sites to green field condition over the next half century. In his report to Parliament on the 1993 accounts of all government departments, the auditor-general said the provision of $200 to $300 million failed to include the likely cost of "the most significant portion of decommissioning activities." The plan includes expected near-term costs for shutdown reactors, but not for research reactors and many facilities currently in use at the Chalk River and Whiteshell laboratories.

Quote of the Month

"/ will not say, you keep generating nuclear power even if it is uneconomical. But if you keep practising it, it will become more and more economical."

S.K. Chattarjee Director NPC
lnFrontine June 17 ,1994

Moreover, the auditor-general said, In future the corporation intends to provide an allowance for the costs of decommissioning and site remediation only to the extent that funding from external sources is realised." That was inadequate to properly determine AECL's financial position and could result in demands on Parliament for further funding in the future.

Ray ***Silver***
Nucleonics Week ***April 28,1994***

Lesson Number 4: Whoever Does the Damage and whoever might be at fault, You Pick Up the BUI

The Clinton Administration is pushing for a new international treaty on liability for accidents in nuclear power plants. The treaty would globalise responsibility for paying damages in case of nuclear accidents with costs being shared by all countries that use electricity from nuclear power plants.

Western nuclear supplier companies, still eager to do business in the ex-Soviet Bloc, are balking at the current lack of protection aguinst legal action if they install equipment at plants that later have accidents causing third party damage. The treaty's immediate aim is to protect these companies.

Under the proposed new framework, damages for accidents would be paid out of an international pool of funds, to which each member country which has nuclear power plants would contribute. Every country that agrees to sign the treaty would contribute at least about $ 280-million for accidents that occur within its borders.

The proposed treaty puts a limit of $ 1.4-billion in damages for any nuclear accident. The estimate is that at the most, a country would have to pay $ 105-million for accidents that might occur outside its borders—but the exact amount would depend on the amount of nuclear power it uses.

Existing U.S. law, which will continue to be operative even after the proposed treaty is signed, provides up to nine billion dollars in liability coverage of a nuclear accident as opposed to $1.4-biilion in the proposed treaty.

Indian Express ***June 7,1994***

Lesson Number 5: Despite the Hidden Subsidies, Private Executives Answerable to Shareholders, Have No Confidence In Nuclear

Senior U.S. utility executives are less confident today about U.S. nuclear power's future than they were two years ago according to a survey. Released by Washington International Energy Group, a consulting firm, the survey is based on responses to a four page questionnaire covering a wide variety of issues.

Asked if there will be "a resurgence of nuclear power in the U.S." only 37% of respondents answered yes. Two years ago, 68% said there would "definitely or "probably" be a rebirth. Asked, "Do you think your company would ever consider ordering a new nuclear power plant?" 721 of the respondents said "no" this year, up from 57% in 1992. What's more, just 9.5% said their companies might consider ordering a new plant, down from 13.8% in 1992 and 16.5% in 1993.**

The report, "1994 Electric Utility Outlook," notes that by nearly every measure, the quality and safety of nuclear performance in the U.S. is at an all-time high. The public attitude toward nuclear is also lees stridently negative than in the past. Paradoxically, this success finally has been achieved at the same time that many Chief Executive Officers (CEO) have come closer to deciding that nuclear may not be able to survive in the competitive marketplace. Privately, many CEOs talk about someday turning over title of plants—even the best-run ones—to the government. Many more are preparing to write down their massive overhang of nuclear debt."

Nucleonics Week January 13, 1994

Third World Bureaucrats with Public Money to Squander Are Enamoured of the Charms of Nuclear Power!

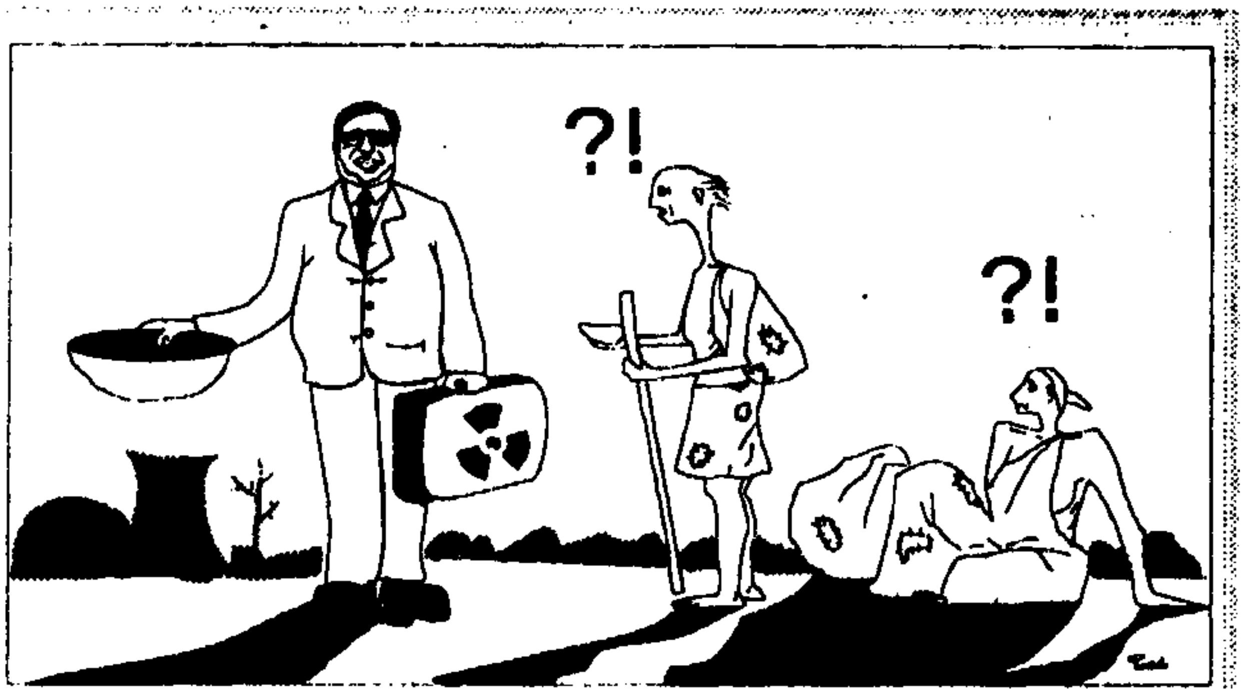
India's nuclear establishment, which has had to prune its plans for 10,000 megawatts of installed nuclear capacity by 2000 to just 3,800 MW in recent years because of money difficulties, is getting surprisingly positive signals from bankers and investors.

There were no takers for the Nuclear Power Corp.'s (NPC) bonds in the last two years. "Today I am able to borrow at low rates of interest from banks and financial institutions and even non-resident Indians" settled abroad, said S. K. Chatterjee, NPC managing director.

Current installed nuclear generating capacity is only 1,720 MW from nine reactors, just 2.5% of the country's installed power capacity The government has given the green light to the NPC to explore financing for joint ventures for plants and the NPC was able to tie up with the southern Indian states to set up a plant in the region with the corporation taking 51% ownership. However, the idea did not click with the western states like Maharashtra and Gujarat. One inhibiting factor seems to be the condition imposed by New Delhi lawmakers that the state-controlled NPC must be the majority owner with 51% equity. The NPC finds it tough to come up with even this much capital.

However, the corporation is thinking of building two 500 MW pressurised heavy water reactors at TWapur at an estimated cost of 60-billion rupees in addition to its ongoing projects. The government has indicated the NPC can go to financial markets to raise funds for this project, but the NPC has no source for its Rs 20-billion share other than the government, according to Chatterjee. He was confident the new-found enthusiasm among the bankers to come up with loans for nuclear power plants will help the NPC to go ahead with added capacity. The banks are now convinced nuclear power is economically viable in areas where there are no cheaper fuels like coal.

Nucleonics Week April 14,1994



The New Boy On The Street!

Bangladesh Considering Nuclear Power

DHAKA, April 22 (UPI) Atomic energy experts are urging Bangladesh to consider building a nuclear power plant in the Northwest section of the country. "Nuclear power is technically and economically viable for Bangladesh," they told Prime Minister Khaleda Zia during a secret cabinet meeting April 14, the Financial Express reported.

Officials of the Bangladesh Atomic Energy Commission told cabinet members a 300-megawatt nuclear power plant in Rooppur, 170 km (105 miles) from Dhaka, could be running by the end of 1995 at a cost of $600 million. *(Nobody, but nobody has ever managed to get a plant ixinning in less than twoyears!*—Editor)

Rooppur, on the banks of the Ganges River, was selected in the early 1960s as a possible site for a nuclear power plant. Nearly 300 acres of land already has been acquired for the purpose, the paper said. (Editor's Note: As is usual with nuclear sites, Rooppur is not traceable on any decent sized map of Bangladesh. However, from the description it should not be very far from the Indian border. Could friends in West Bengal take the trouble to send in its exact location?)

But a lack of funds prevented construction of the plant, said BAEC briefing papers presented to the cabinet and obtained by the newspaper. Bangladesh suffers from a chronic shortfall of electricity, particularly in the summer when total production of 1.800 megawatts fails to meet the demand of 2,200 megawatts. The country uses locally- extracted natural gas and coal and imported oil to generate most of its electricity.

Government officials reportedly already are looking into suppliers for reactors, including China and Germany if they decide on a 300-megawatt product and the United States and France if they want a 600- megawatt plant, the newspaper said.

Indonesia Ready to Go Nuclear

Indonesia's plan to build two 600-MW reactors will be put before the country's Energy Co-ordination Board within 60 days said Djali Ahimsa, *{most appediately named*—Editor) the director general of Indonesia's Atomic Energy Agency.

Mitsubishi, Hitashi and Toshiba, one Asian diplomat said, are ready to build a reactor in Indonesia as a loss-leader. "The Japanese want to get a foothold in the Asian nuclear power market which is expected to grow," he said.

In advance of the nuchar power project, Ahimsa said, Indonesia has already expressed interest in Japanese vendors'fuel cycle services. But Indonesia "still needs to assure the world that our programme is peaceful and transparent," he said. *{Heard thai one before?*—Editor) He said, "We are counting on foreign credit financing for 80% of the project and for 20% of the funds to be raised in the Indonesian market."

France Hopes For Power Surge In Asia

France's state owned power company Electricity de Prance (EDF) is shifting its emphasis in Asia from passive consultant to active partner according to Jean-Christophe Delvallet, the company's Far East Managing Director.

EDF played a pivotal role in helping China design and build the Daya Bay power station, a massive and controversial project near the Hong Kong border.

France's domestic energy market has been stagnant for several years, for EDF to look beyond its national borders for lucrative ways to expand the production and export of its energy. According to company figures, EDF earned a net income of $526 million last year, up 18 percent compared with 1992. The increase was possible in large part because of the company's export business throughout Europe. "Now we are developing a good understanding of how things work in Asia," Del vallet said. "It is going to be a very important part of the world for expansion."

Ian Stuart UPl April 13,1994

I Letter Box

You must be wondering who is more irregular and unpredictable—*Anumukti* or CANE members ! Let me assure you that *Anumukti* has been far more active and regular than us. Though for a few months when the little journal did not appear, I sort of took it as Good News. After all magazines like *Anumukti* are not needed in a sane society. If you don't feel compelled to bring out the journal, the reason may be that the nucleocrats are also not being very active.

CANE as such has become quite inactive. We met recently after a gap of several months, to discuss your letter regarding Dr. Gopalakrishnan's offer of talks. The general consensus was that we should go along with the proposal, though everyone had his own reservations. There were doubts regarding the motives behind the offer. I am also not convinced that AERB chief could be ignorant of health effects of radionuclides / radiation. In your letter you have suggested that his ignorance may be due to his engineering background, but being an engineer myself, I know that engineers are quite capable of understanding other subjects quite well. He may be testing the extent of your knowledge so as to use it in their campaign. But despite our apprehensions we all feel that the dialogue as suggested by Dr. Gopalakrishnan is a good idea. As a first gesture of openness why don't you ask AERB to send you *Nuclear India* regularly? (I did precisely that, and I have started receiving the rag along with *AERB newsletter* regularly. - Editor)

The news on Kaiga is somewhat encouraging. The Karnataka Chief Minister has declared that "all difficulties faced in the project have been cleared." Which means that the project has been having hurdles and will continue to do so. .

CANE has gone into such a deep slumber that most of us had forgotten about April 26 altogether. There is no follow-up on the Supreme Court directive to Ministry of Environment, either. The next step required was hectic lobbying from North Kannada, but they too have gone into a coma. (This letter was written just before the dome collapse in Kaiga. Hopefully the reverberations from the collapse will shake the antinukes not only in Karnataka but all over, from their lethargy. - Editor)

I also wanted to join issue with you regarding the tone of your editorials, specially about the chaos 'created'by your computer. Being antinuke is no license for being anti-technology. There are no alternatives to good technology and computers are very good technology. Our problem is to identify what is good technology and what is not.

Sanjay Havanur
Bangalore

Anumukti for postcards !

Postcards have disappeared from rural Gujarat. For months on ***end we*** *have* ***been trying*** *desperately to get a few and during our cycle yatra to Saurashtra we seq* ***hed*** *at each* ***and every*** *post office on the way without any success.*

Anybody sending in his or her subscription in the form of 200 postcards will not only get six issues of Anumukti, but two extra back issues plus ofcourse our heartfelt gratitude expressed on a postcard.

Anumukti Vol.7 Number 4 February / March issue, seems to me one of the best issues ever. I particularly appreciate all the information published about Ms O' Leary's revelations regarding the secret US nuclear experiments on their own population.

It was most interesting to read that AERB chief visited Vedchhi!

Every Indian citizen has the right to full scientific information in clear language. That is why I feel that each Anumukti issue should carry a short list of facts regarding what nuclear energy is and what it does. Knowledge is Power and one who knows can act and protest!

Sibylle Sharma-Hablik
Pondicheny

I enjoy reading Anumukti very much, for its informative yet chatty style. Alas, constraints of time and a total absence of activism in Nasik prevent me from much more than being informed about nuclear issues. But my good wishes and support are with you,

Sushma Sagar
Nasik

There are vague hints about revival of Koodankulam. I have requested Sister Agnes of Thiruchirapalli to continue the local opposition at Nagercoil to the planned and aborted Russian plant.

The recommendation of European experts to close down the functioning two Chernobyl plants is another proof of the utter futility of the existing plant. The upward revision of mortality at Chernobyl from initial 31 to now seven to eight thousand is utterly shocking but not wholly unexpected.

Any data on the health consequences of the exposed population at Rawatbhata should be published in lay press from time to time.

DrCN Deivanayagam Madras

I just got the latest Anumukti and I find that Dr. Zia Mian has sent you his articles which I had also received. If anyone contacts you, wanting copies of his articles **please** send their addresses on to me and I will send them Xerox copies.

H. Basappa
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Bangalore 660020

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Rs. 30/- pier year (6 issues) within India
U.S. $ 15/- per year or equivalents other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the Slate Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 6/-
Subscriptions, donations and enquiries regarding drculation should be addressed to:

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Sampooma Kranti Vidyalaya
Vedchhi, 394 641 India
Tel: 02625-2074

Please do not send personal cheques or drafts addressed to Surendra Gadekar

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Published by S Gedekar for Sampooma Krand VidyaJaya and
printed at
The Parijat Printry, Ahnwdebed

PRINTED BOOKS

ANUMUKTI

A Journal Devoted to Non—Nuclear India

Volume 8 Number 1 August / September 1994

Action Alert Kakrapar

The floods were bad enough but the Incompetence of authoritios knows no bounds

Following the heavy rains of June 15 and 16, floods devastated the Kakrapar Atomic Power Station (KAPS) as was reported in our last issue. The fury of the floods was such that it not only drowned 80 motors and pumps in the turbine room, but broke the waste management facility and lifted canisters of solid radioactive waste and carried them out into the open. However the flood was not strong enough to shake the complacency and arrogance of nuclear and civic authorities. They have continued their policy of deception and bland 'trust us' reassurances. No effort has been made to inform and educate the public especially those living in the vicinity of the station. The incompetence and callousness of the nuclear authorities and the ignorance coupled with the high-handed attitude of the civic authorities together is in itself a serious hazard to public safety.

Ducts and storm drains connect the turbine building of KAPS to the Moticher Lake situated just behind. The lake is not a natural lake but a man-made lake and has gates situated near the village of Ratania to control the flow of water. Following heavy rains on June 15, the level of the Moticher Lake began to rise. The outlet ducts became inlet pipes and water began entering the turbine building on the night of June 15th itself. By the morning of June 16th, there was water not only in the turbine building but in other parts of the reactor complex. The morning shift had to swim in chest high water to get to work and the control room according to one rumour was "inaccessible for some time".

The floodwaters breached the solid waste management facility and lifted canisters of waste and carried them out into the open. Since the authorities have not been forthcoming with detailed information (See page 3 and 4), it is not known exactly how many canisters were swept away. The original news-report spoke of four but the KAPS superintendent said only one had been lifted and whose lid had become "loose".

What Did The Authorities Do?

First of all they slept; then they bickered among themselves; after that they issued misleading and erroneous statements to the press;(See Collector D.P.Trivedi's statement on page 4) blamed and cursed "trouble-makers" and "vested interests"; and finally they slept again.

All these years, the gates of Moticher Lake at Ratania were never operated so much so that according to the authorities' own admission (page 4) "A lot of grass has grown very tall near the gates." Even as the

flood waters were entering the turbine building on the night of June 15th and causing havoc, the KAPS authorities slept. No action was taking till the "gentlemanly' hour of 11 O'clock on 16th morning when a site emergency was declared and workere evacuated. (My guess is this action was taken due to the 'automatic' radiation monitoring unit detecting radioactivity in the environment.)

After the situation had become desperate and there was water, water everywhere, the KAPS authorities woke up and started frantically asking the district and the state authorities to use their influence to get the gates of the Moticher Lake opened. However, the gates after years of neglect could not be opened. Nearby villagers, worried about the security of their own homes, caused a breach in the embankment of the lake which allowed the waters to drain out. It was only on 18th of June that a large pump was brought to Kakrapar from Tarapur, that the work of removing the water from the turbine building could begin.

The KAPS authorities did not think it their duty to inform the public or even the Atomic Energy Regulatory Board (See Editor's commentary on page 5) of the events that had taken place. Whatever information that did come out was not because of but despite their doing. Reporters from *Abhiyan* and *Gujarat Samachar* along with yours truly happened to visit Kakrapar in connection with a different article on nuclear power. The KAPS authorities refused to talk; but workers showing a greater sense of responsibility did. It was only after the report was published that the KAPS authorities and the collector of Surat issued their statements.

The statements that they did issue display an economy with truth that would be commendable if applied to public funds. For instance, the district collector says in his statement (See page 4) "Before starting the reactor, it had been subjected to all the stringent tests and conditions." This statement might be true but it is equally true that the reactor did not pass all the tests. The Emergency Core Cooling System for one did not work as expected during the test and needed "fixing". As admitted by the present chair of the Atomic Energy Regulatory Board in an interview with. *The Telegraph*, the system was not again subjected to the same test to see if the fix worked. Similarly the contention in Mr. Trivedi's statement that had the reactor been in operation, there could not have been any accident is more hype and hope than fact. The authorities had no control over the amount of water that was entering the building and not only the regular electricity supply but also the diesel emergency power supply could have been disrupted reminiscent of the situation during the Narora fire of last year.

Had there been an off-site emergency needing evacuation of people, there was no way that it could have been accomplished in a reasonable time-frame. The floods had caused havoc to roads and bridges. Even now, three months after the event, it takes more than an hour to traverse just 15 kms on the highway with a motorcycle. Less manoeuvrable vehicles like trucks and buses take longer and there are large number of trucks turned turtle dotting the highway. The condition of side-roads in some cases is much worse.

What Can You Do?

Show and express your solidarity with the people living around Kakrapar who in their hundreds are writing letters to their elected representatives and the Chief Minister of Gujarat demanding an all-party commission of inquiry. You can send your letters to the Prime Minister, the Minister for Environment, your local MP, chairman DAE and of course the Chief Minister of Gujarat. Please send a copy also to us. In this letter, please ask for:

Constituting an all-party enquiry committee which would investigate and report to the public in a reasonable time. The committee should look into the following:

- What were the reasons for the delay of at least 12 hours between the flooding of the turbine room and the declaration of site emergency?
- What were the reasons for declaring the site emergency?
- Why were the people living in the vicinity (within 30 kms) of the plant, not informed of the situation?
- What was the extent of the damage to the waste management area? How many waste filled drums are kept at different locations within the KAPS premises? What are the contents of these drums?
- What amount and kinds of radionuclides were released to the environment? What are their long term implications for public health?
- How do the authorities propose to evacuate the public in case of emergency during monsoons when the condition of the roads makes the task impossible?

Neither the stalled unit-1 nor the completed but yet to be started unit-2 should be allowed to start functioning before the committee satisfies itself that public safety would be maintained in case of emergency. The report of the committee should be made public and published in newspapers.

Surendra Gadekar

The Official Response fo Kakrapar Flooding

The chief superintendent of Kakrapar Atomic Power Project Mr. J. B. Kalaiya, along with other high officials of the project visited the Surat office *of 'Gujarat Samachar'* subsequent to the publication of the report regarding the flooding of the Kakrapar plant following the rain of June 15th and 16th. While he had himself refused to meet journalists only the day before, Mr Kalaiya eagerly and on his own initiative sought an interview after the publication of the report. The following is a translation of the interview. We are reproducing it because this is the sum-total of the official response. In the following Q. stands for the interviewer of Gujarat Samachar and A. for Mr. Kalaiya.

Q. What has been the total damage to the plant?

A. There has been no damage to the pumps and motors as such. No machinery has been destroyed. How*ever,* some repairs would be needed whose labour costs could run up to Rs 10 lakhs.

Q. How much water had entered the plant on June 15th?

A. Water had not entered into all the installations in the plant.

Q. Is it true that there is 56 tonnes of uranium stored in the plant?

A. I am not at liberty to answer this question and confirm or deny whether there is uranium stored in the plant.

Q. Was the plant shut down?

A. Yes.

Q. If the plant had been operating and these pumps had drowned what would have happened?

A. We have three separate and independent systems which can shut down the plant within seconds in case it had been operating.

Q. How much water entered the turbine building?

A. There was 25 feet of water in the turbine building.

Q. WAS site emergency declared in the plant?

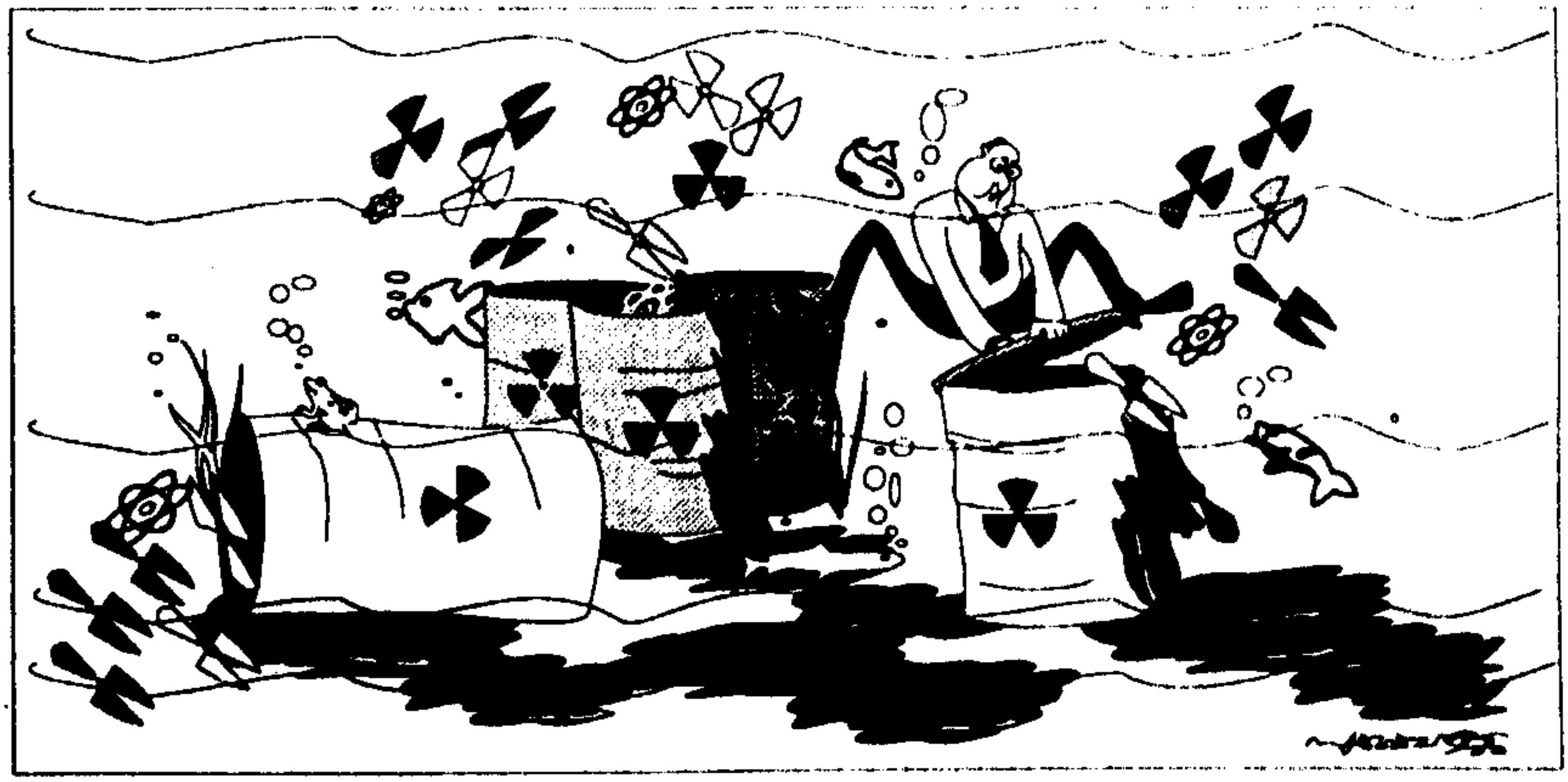
A. Yes, we declared site emergency at 11 A.M. on 16th June.

Q. When will the plant start again?

A. We expect it to start in the second week of July.

Q. Is there a 'monsoon committee'and who are its members?

A. Yes. There is Mr Sinha who is an administrator and there are some seven to eight engineers.



kakrapur 1994

Notice of Shri D.P.Trivedi Collector, Surat

The Kakrapar Atomic Power Station is this country's fifth and most modern atomic power station. This atomic power station has been built within schedule despite adverse circumstances at a cost of around Rs. 1350 crores. It adheres to the highest internationally accepted safety standards. Before starting the reactor, it had been subjected to all the stringent tests and conditions imposed by the government appointed Atomic Energy Regulatory Board. The design of the atomic power plant takes into consideration site specific factors such as geographical conditions, the rainfall and flood patterns of the last 40 years, and the arguments of seismic experts. On 15th and 16th of June, due to inconceivably heavy rainfall in the whole area and the extremely fast rise in the level of the Moticher Lake and the Kakrapar dam catchment area, affected the whole area and also the plant. There was more than 9 feet of water flowing above the Kakrapar weir. In circumstances beyond human and plant management control, this water had entered the turbine room of unit-1 and unit-2 and the pump house through storm drains and the inlet pipes from the Moticher Lake. In these circumstances, the plant engineers had closed the gates on inlet pipes of the pump house and a site emergency was declared at 11 O'clock as per prescribed procedures and all efforts were made by the workers to remove the water from the plant. The reactor was in a shutdown state at the time, but had it been operating it could have been shutdown within a few seconds. This plant uses natural uranium only 0.7% of which is fissionable. Had these circumstances arisen when the plant was operating, the resultant steam would have gone into the reactor building, it would have gone into the suppression pool of the reactor building and would have condensed into water. These safety features are part of the reactor's safety system and there is no fear whatsoever that had the reactor been in operation when the flooding took place than half of Gujarat would have been affected by the explosion. Today (June 22nd, 1994) after having made an inspection, I am making this statement as the off-site emergency director of the plant to bring these facts for the attention of the public.

Q. Why did it not take measures to prevent the flooding of the plant?

A. The committee's work is to deal with ordinary rain.

Mr. Dipak (Technical Services Superintendent):

What happened was beyond anybody's imagination.

Q. What is the condition at present of unit-1 and unit-2?

A. All together about 40 motors in unit-1 and the same number in unit-2 have water in them.

Q, Was the Ratania gate of the Moticher Lake opened?

A. Mud has collected around the Ratania gates of the lake. Actually, there is an island in the lake and the gates are on this island. A lot of grass has grown very tail near the gates. The gates are manually operated. Despite lot of effort the gates of the lake could not be opened.

Q. Had the gates been opened would it have made any difference?

A. Certainly it would have made some difference.

Q. I hear that valuable records have also got destroyed in the flood.

A. Well, records... A little bit... some account books, correspondence regarding plant construction, some drawings, and other stationary has been destroyed.

Q. What is the condition of the computers?

A. Some computers bought in 1985 and 1986 have suffered some damage.

Q. So, really there has only been damage worth Rs 10 lakhs?

A. Yes. There is of course the production loss. The plant was to have started on the 16th of June. That did not happen. If the plant operates at full capacity, then there is a loss of Rs One crore for every day that the plant gets delayed.

The next 'event' took place on 29th June with the publication of a report in *Gujarat Mitra* which claimed that during the floods on 15th June, the water had breached the waste management facility and four drums of solid radioactive waste had been swept away. The containers, according to the paper had spilled some of the contents outside, which had been collected later by the authorities. The paper talked about the threat posed to Surat city which is downstream of Kakrapar on river Tapti.

Since this was a 'sensational' disclosure, all the inhabitants in villages around Kakrapar including the Anumukti team were waiting with baited breath for an official response. However, there was no response at all till the 8th of July; when the district collector Mr. D.P.Trivedi was invited along with a large posse of pressmen from Surat to Kakrapar for a briefing. In the briefing, Mr. Kalaiya repeated most of the things he said in his previous interview with *Gujarat Samachar*. Regarding the waste, the statement of Mr. Kalaiya were reported differently by different newspapers.

The *Indian Express* said:
"Mr. Kalaiya described as misleading a report in a local daily that four drums containing nuclear waste had been swept away by swirling waters resulting in a leak of radio-active material from the drums. He agreed that water had seeped into the two-metre trench meant for keeping these drums but no drum had been swept away. One of the drums had been lifted a little by the water and from it a container with the waste inside had come out. But he said, the container had not opened ruling out the possibility of leakage of material. "But despite this, we took samples of the water in the trench, tested it and sent the report to the Gujarat Pollution Control Board," he said. The test had not found any contamination, according to him.

"Besides, Mr. Kalaiya explained that the waste stored here was that which was left during clean ing-up and maintenance of the plant. This waste was very low active and had radioactivity of less than 0.03 MR, he added. The more radioactive wastes were being reprocessed at Tarapur and was not released into the atmosphere, according to him.

On the other hand, *Gujarat Mitra* had this to say regarding Mr. Kalaiya's remarks regarding the waste.

The rainwater which entered the plant in flood force had breached the spot where radioactive waste is stored in special cans. The lid of one of the cans had become loose due to which the radiation monitoring unit had automatically started. Experts had immediately begun to study whether radiation had spread to various neighbouring zones. Wind direction, water, soil and cattle samples were examined and so also different samples were collected. Nothing has come out which can be a cause of any worry. There is regular sampling of radiation in the zones adjacent to the reactor."

Gujarat Mitra also reports that Mr Kalaiya had also appealed to the neighbouring public not to give way to panic and informed that he the chief superintendent of KAPS, the district collector, the police commissioner, the chairman of Atomic Energy Regulatory Board, were in contact 24 hours through telephone, telex, satellite channel, wireless etc. So that even in case of an accident these worthies would have been informed immediately.

There has been no further word from either the district collector or Mr. Kalaiya the station superintendent of Kakrapar since the 8th of July, and it seems as if they have decided that the matter is closed.

Editor's Commentary

Since the *Indian Express* and the *Gujarat Mitra* reports regarding Mr Kalaiya's explanation about the waste and swirling waters are so radically different, one claiming that no waste was spilled at all, while the other saying that it did and talking about the automatic radiation monitoring unit getting started, I will leave it to the reader to come to his or her own conclusions as to what actually took place that fateful day.

I would only like to make a small comment regarding Mr. Kalaiya's use of numbers and units. I find this 'scientific' rigmarole a regular feature of nucleocrats' efforts at 'educating' the public. Units for radioactivity are becquerrels (one disintegration per second) and curies (3.7×10^{10} disintegration per second). There is no unit of activity called MR. Presumably what is meant by this MR is milli-rem. Rem is a unit of dose. If one knows the activity of the waste cannister and what kind of waste there is and what kind of radiation it emits and the energy of that radiation then one can calculate the dose per unit of time that the can emanates. Capital M is usually used to denote mega (million) rather than milli (thousandth) which is denoted by small m. In any case, the 0.03 MR still does not make any sense since no time interval has been specified.

On July 18, 1994 I wrote Dr. A. Gopalakrishnan, the chair of Atomic Energy Regulatory Board, a letter informing him of what Mr. Kalaiya had said to newspapers and requesting information regarding when the AERB was officially informed.

As luck would have it I met Dr. Gopalakrishnan himself in Delhi on the 8th of August at a meeting called by INTACH—a voluntary organisation which wants to organise a national workshop on 'Nuclear Safety and the Public' on February 3rd and 4th, 1995. The first thing Dr. Gopalakrishnan said to me was, "I have received your letter and you will be getting a reply soon."' I have still (31st of August, 1994) not received any reply to this letter

But I did ask Dr. Gopalakrishnan the same questions and his oral replies are the following:

Regarding waste, he said that the canisters were not totally filled and hence they had buoyancy and as a result they floated in the water and had to be searched and fished out. But they had not opened. On my asking him if that were the case then how come the radiation monitoring unit had automatically kicked-off, he had no answer. He said that he would be visiting Kakrapar on August 24th and would make it a point to meet us. However, he hasn't come as yet.

Regarding when he was informed by the KAPS authorities about the flooding he said that he came to learn of it on June 23rd, when *Gujarat Samachar* carried the story. So much for the 24 hours contact with telephone, telex, satellite chanel, wireless, etc.

A National Treasure Or A Global Security Risk

What To Do With Hugo Stocks of Surplus Plutonium?

Ite makers had hoped that plutonium would lead the world to a utopia created by a boundless source of energy. Glen Seaborg, who led the team that first isolated it, felt that plutonium would provide the energy to make deserts bloom and enable "planetary engineering"; there would be earth to moon shuttles; sea water would be made potable. "My only fear is that I may be underestimating the possibilities," he said in 1968.

> *"The plutonium we no longer need for weapons is a global security risk and an economic liability."*
>
> *Hazel O'Leary,*
> *US Energy Secretary*
>
> *"Plutonium has essentially a negative economic value,"*
>
> *John Gibbons, Scientific*
> *Advisor to President Clinton*

The Indian establishment as also the Russian, has a similar view. They both see plutonium as the currency of power—the gold of the nuclear age. The direction of nuclear energy policy in India is towards establishing a plutonium based programme.

Right now, India is a long way off from this goal. Although, our reactors produce a good deal of plutonium in the spent fuel, it comes mixed with all kinds of highly radioactive fission products that need to be separated out before one can obtain the plutonium in a usable form. This process is known as reprocessing. India has a small reprocessing facility at Trombay and a slightly bigger one at Tarapur. Another reprocessing plant is undergoing construction at Kalpakkam in Tamil Nadu. However, obtaining enough plutonium for a full reactor load from these reprocessing plants would still take years. Having enough plutonium for making a bomb is another matter and we have already demonstrated our ability to do that twenty years ago.

The Scale of the Problem

The Americans and the Russians are in a different position altogether. During the Cold War, each had produced huge quantities of plutonium and highly enriched uranium (HEU) at enormous cost in money, health and environmental damage.

With the arms race winding down, these large stocks of plutonium and HEU are coming out of weapons. Over the next decade at least 50 tons in the United States and probably a little more in Russia. In addition, there is some 33 tons or more of 'other plutonium" found around nuclear weapon's complex in the US alone, much of it scrap and other forms not easily made into fuel.

It is crucial that this surplus weapons plutonium be managed in a way that minimises the danger that it will be re-used for weapons by the initial possessor nation, another nation, or a sub-national group; strengthens national and international institutions and incentives for control and reduction of nuclear weapons; does not lead to increased accessibility of civilian plutonium for weapons use; and meets reasonable standards for safety, health, the environment and cost.

Highly enriched uranium does not constitute a proliferation risk. It can be easily diluted with natural uranium so that the resultant is no longer so highly enriched and cannot be used for making bombs. Recovering bomb-usable material from diluted HEU requires technologically demanding and costly isotopic separation. In contrast, plutonium offers no such possibility of "denaturing".

The Russians, even after fifty years of experience with plutonium still regard it as an asset not a liability It is, as one official put it, "a national treasure", to be husbanded now in order to produce boundless energy for future generations. Besides the plutonium in weapons, there are large plutonium stocks accumulated for use in power plants. Russia is also planning a new generation of nuclear power plants called breeders that create more plutonium than the nuclear fuel they consume. And that plutonium, while not as pure as that from weapons, would still be readily usable by weapons makers.

What is more, senior Russian officials say they plan to pay for these costly plants in part with dollars from the US government money that the Russians will earn from a contract to sell America highly enriched uranium.

The United States has contracted to buy Russian HEU to use it in civilian reactors for energy, but the real American purpose was to reduce the chances of theft or sales on the world market, a goal that could be undercut by the Russians use of the revenues to build breeder reactors.

Thus, the gap in attitudes about the nuclear legacy looms large.

Russia wants to keep its surplus plutonium in a pure form, the form in which it is used in weapons. This would make it attractive to terrorists or nations that want such a weapon; as little as four kilograms, would be enough. Even without thefts, the more plutonium that remains in an easily accessible form in either country, the easier it would be for a future Russian or American government to rebuild a giant nuclear arsenal quickly.

While American officials believe their own stockpiles are safely guarded for now, they argue that disposal of plutonium now could help protect future generations. The United States, which first synthesized plutonium and has spent billions of dollars and done substantial damage to the environment and human health in the process, is ready to dispose of it. The question is how!

Plutonium is a Ilability

The US National Academy of Sciences (NAS) issued a report in January 1994, entitled *Management and Disposition of Excess Weapons' Plutonium.* The report examines the problem of the management and disposition (long-term management) of plutonium from unwanted nuclear weapons at the end of the Cold War.

The report warns that excess military plutonium poses high security risks and at the same time affords no economic advantage for the foreseeable future. It states that "exploiting the energy value of plutonium should not be a central criterion for decision-making, both because the cost of fabricating and safeguarding plutonium fuels makes them currently not competitive with cheap and widely available low-enriched uranium fuels, and because whatever economic value this plutonium might represent now or in the future is small by comparison to the security stakes."

The NAS analysis shows that even when the plutonium itself is assumed to be "free", it costs more as an energy source than uranium because plutonium processing and the fabrication of fuel containing plutonium is so expensive. (In most cases, plutonium is used in a reactor fuel known as MOX a mixture of oxides of plutonium and uranium).

The report also discusses the issue of "civilian plutonium", or plutonium recovered from reprocessing spent

Plutonium Storage:

In the nuclear weapons complex, plutonium is primarily found in three forms: plutonium metal, plutonium oxide and plutonium nitrate solutions. Each form poses its own set of potential problems that may result in the release of plutonium from storage containers or create difficulty in handling. Plutonium metal reacts with oxygen in air (or corrodes) to form plutonium oxides. Of these oxides plutonium dioxide (PuO2) is the most prevalent. The formation of plutonium dioxide from plutonium metal is accompanied by release of heat and a large expansion in volume, which may breach the primary storage container according to the US Department of Energy's own assessment.

Plutonium oxide normally consists of small particles. If not properly contained, such particles can easily be dispersed and inhaled. Plutonium oxide has the ability to adsorb (to stick: see box on jargon) water and organic molecules on its surface. If the container (and thus the plutonium inside it) is heated, or if chemical reactions within the container raise the temperature, any adsorbed water on the plutonium may be released as steam, building up the pressure in the container. Pressurisation can also occur when the adsorbed materials are slowly released over time. In addition, the adsorbed molecules are subject to radiation from the plutonium, which can chemically break them up. The process of chemical breaking of molecules under the action of radiation is called radiolysis. Radiolysis can also cause problems in the packaging of materials; any plastic in the packaging, for example, may disintegrate. Unfortunately, the DOE wrapped and sealed many containers in plastic bags in an effort to minimise the spread of contamination. A breach of the primary containment would therefore put plutonium in contact with the plastic. Radiolysis of some types of plastic bags releases hydrogen and gaseous hydrochloric acid, both of which react with the container material and the plutonium metal. There reactions increase the risk of fires; some of them also release heat within the container. Such reactions in turn increase the risk that the plutonium will not be contained.

Other kinds of hazards can result from other material properties of plutonium. In some case, plutonium is pyrophoric (spontaneously igniting in air). Clean plutonium metal does not burn at room temperature, but the higher temperatures associated with machining plutonium metal have caused numerous fires in the finely-divided plutonium metal machine scraps. Secondly, the decay of short-lived plutonium-241 yields americium-241, which emits penetrating gamma radiation and can thus cause worker exposure. Spills and criticality are important concerns for plutonium nitrate solutions.

It Pays To Increase Your Jargon Power

1. *pits*

a. a sassy cologne for the manly man; let her know how base you can be

b. what John McEnroe thinks of referees and linesmen

c. a hollow sphere of plutonium-239 or uranium-235 metal. It is the trigger of nuclear weapons — the first part of a nuclear explosion in the primary stage of a nuclear weapon.

2. *pyrophoric*

a. having a phobia of spontaneously catching on fire

b. an obscure eighteenth century term that referred to pirates who had successfully found treasure. It eventually was used by royalty to express a feeling of euphoria (as in "totally pyrophoric, Duke")

c. the ability to ignite spontaneously in air. Several metals used in the nuclear fuel cycle, such as liquid sodium, plutonium and uranium, are pyrophoric to varying degrees. The latter two metals have an increasing likelihood to spontaneously ignite with rising temperatures or decreasing particle size. However, they are not pyrophoric at room temperature.

3. *vitrification*

a. an especially cruel form of medieval torture involving the force feeding of vitamin supplements

b. the transformation of a sincere and sweet child into a vitriolic teenager

c. to convert into glass. In the nuclear arena, vitrification refers to the glassification of radioactive waste, mixed waste or materials such as plutonium

4. *adsorption*

a. the manner in which humans have long-term memory of television commercials

b. the rate at which various billboard materials succumb to the ravages of birds

c. the sticking of molecules to the surface of a liquid or solid. Adsorption is different from absorption, which involves taking molecules in through pores or soaking up

5. r*odiolysis*

a. the process by which listening to the radio turns you into a couch potato

b. a special hair treatment for bald people

c. the change in the chemical form of a substance caused by the action of radiation

6.MOX

a. a state of utter and complete thoughtlessness. From Sanskrit Moksha. Indian nucleocrats are said to attain this state of mind as they contemplate replacing enriched uranium fuel for the Tarapur reactors

b. a very virulent form of small-pox which left the afflicted mentally retarded

c. from mixed oxide fuel; a way to utilising plutonium by mixing it with uranium for use in light water reactors

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fuel from civilian power plants. Recognizing the security risks from all separated plutonium, including that in civilian nuclear power programs, it recommends that the US and Russia "pursue a reciprocal regime of secure, internationally monitored storage of fissile material, with the aim of ensuring that the inventory in storage can be withdrawn only for non-weapons purposes." As Russia continues to experience severe economic problems and political uncertainty, this is a crucial and very urgent recommendation.

The report also implies that civilian plutonium is a liability, comparing it with producing oil from shale rock, which will remain uneconomic for decades, but which poses no comparable security risk.

Recommandations

The NAS report recommended the possible use of MOX as one long-term plutonium disposition option. If MOX were used in existing nuclear reactors, the plutonium remaining in the waste would be sufficiently mixed with radioactive fission products that it could not be used in weapons without costly and dangerous processing. Alternatively, the report suggested mixing excess plutonium with radioactive wastes and molten glass a process known as vitrification.

Both of these options would make it difficult, costly, and dangerous to re-extract the plutonium for use in weapons. The criterion by which these options were adjudged suitable was the "spent fuel standard" that is, it should be at least as difficult to make weapons from unreprocessed spent fuel from civilian nuclear power plants.

The report also recommended considering deep boreholes (two to four kilometers deep) for evaluation as a disposal option, but recognized that retrievability from such boreholes could cause problems because, in that case, the plutonium could be re-used to make nuclear warheads. On the other hand, the report notes that retrievability might be an advantage in negotiations with the Russian government, which views plutonium as an economic resource.

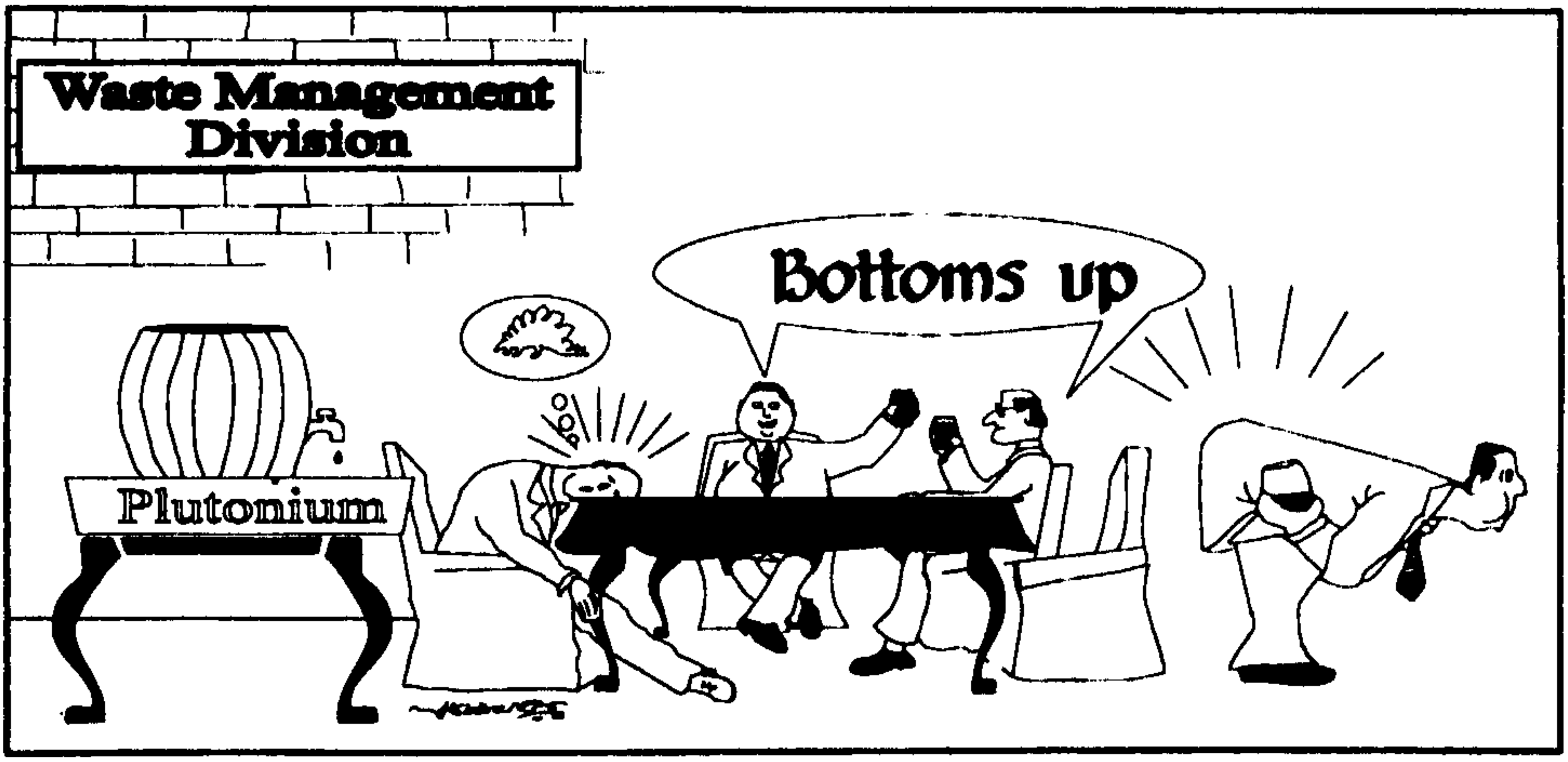
But plutonium would continue to pose a threat even in these hard-to-handle radioactive forms. The report notes that most fission products, which make spent fuel or radioactive glass logs difficult and expensive to handle, decay well before plutonium does. It therefore recommended research into a variety of transmutation options using critical and sub-critical reactors that, in the very long-term, could fission essentially all existing plutonium. The NAS panel recommended this approach a supplement to, and not a substitute for, the two main options.

None of these disposal options can be accomplished quickly it will be well into the next century before they are completed. As Wolfgang Panofsky, Chair of the NAS plutonium panel, told the *Washington Post*, "the world is condemned to having to baby-sit this material for at least another decade," (January 25, 1994). As part of that atomic baby-sitting exercise, the NAS report recommends, all inventories of fissile materials must be declared, and put into international or bilateral verified storage.

One possibility for relatively quick processing of plutonium (within the next decade) is to vitrify it alone, without mixing it with radioactive waste. Because plutonium emits mainly alpha radiation, which is dangerous only when inside the body, it can be vitrified without massive shielding. A far more complex plant would be needed if radioactive wastes emitting far more penetrating radiation were mixed in.

The NAS report considered such an option, but did not recommend it, since the plutonium could be recovered after processing at far lower levels of effort than with spent fuel from reactors, a disadvantage from the point of view of potential re-use in weapons.

However, the report does note that "experience with separating materials from glass is far less widely disseminated than experience with spent fuel reprocessing." For this reason, this measure would provide a considerable barrier to re-use. Moreover, as with deep boreholes, a potential for re-extraction could be an advantage in the near future.



Who Says Plutonium Disposal Is a Problem!

Given the collapse of the economy in the former Soviet Union and the accompanying political and military instability, time is the most important factor in coping with excess plutonium. Added to the problem is the Russian government's attachment to plutonium as a resource. The NAS report should have put the vitrification of plutonium alone at least on a par with disposal in deep boreholes* We recommend that DOE build a pilot plant to test the process with plutonium metal and with various chemical residues present in the DOE complex. This would provide much of the environmental, health, and safety data needed for a sound decision on the vitrification of plutonium.

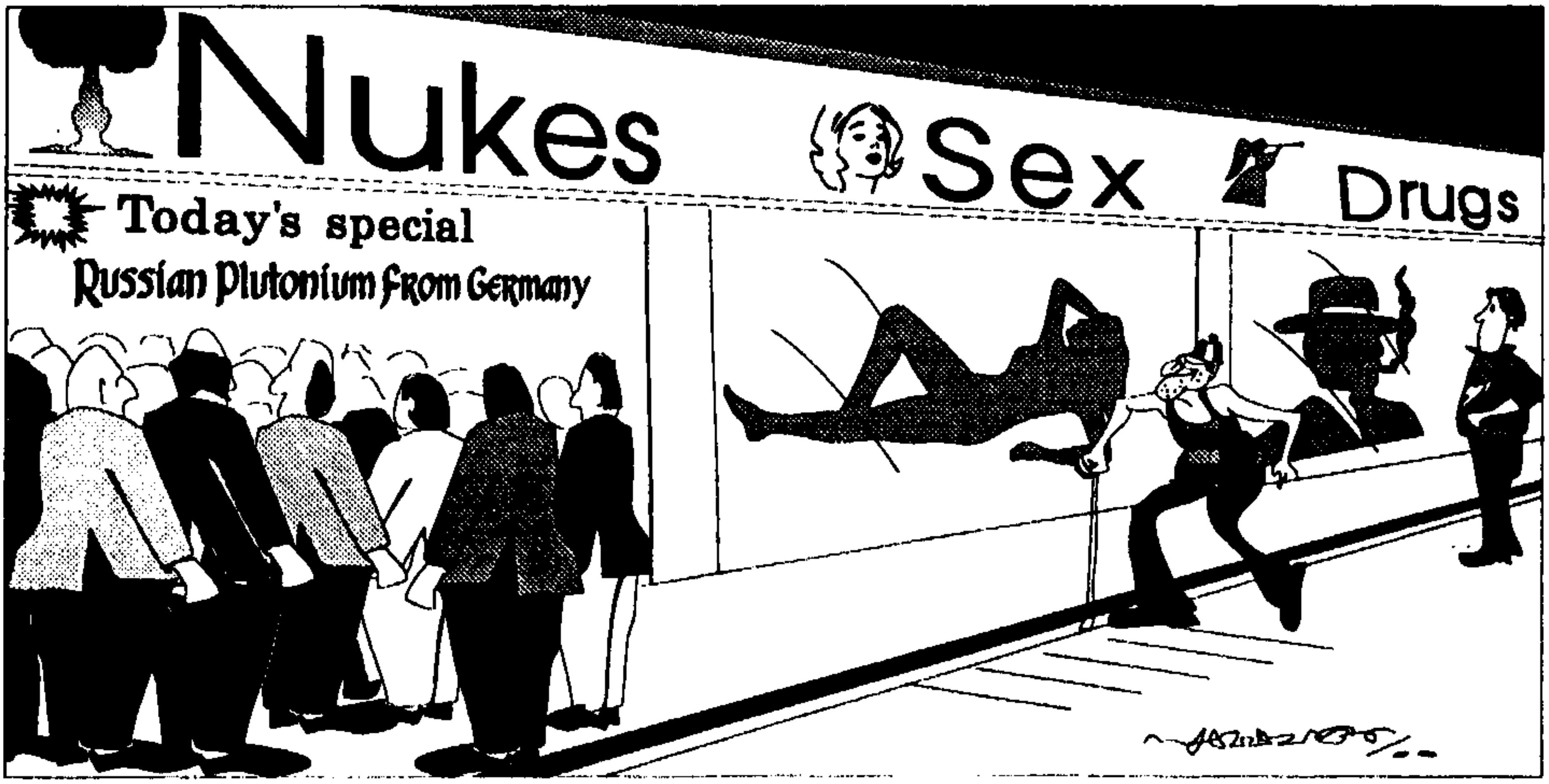
The high cost of deriving energy from plutonium has to do with the enormous precautions that must be taken in processing it (it is highly carcinogenic), with the large capital investment needed for building nuclear reactors, and with the difficulty and expense of decommissioning reactors and disposing of their radioactive wastes. Other burdens stem from safeguarding it, since all grades of plutonium are usable for making nuclear weapons, another important fact that the NAS report highlights.

The Twist In The Tall

All statements from high US officials need to be carefully considered for their Tiidden' agenda. Lest we forget, these are the guys who gave us "Atoms for Peace" in the first place. The continued funding for research on the Advanced Liquid Metal Reactor which is a breeder reactor with a new name and a so-called 'inherently' safe garb does little to generate confidence that the Americans are really serious about getting rid of their own plutonium stocks.

Plutonium was regarded in most of the post-World-War-11 era as the gold of a glorious nuclear age to come. It was not to be. Rather, it has become a terrible liability. Today, knowledge of nuclear weapons technology is so widespread that getting access to it is not a substantial barrier to proliferation, rather, as the NAS report notes, "access to fissile material is the principal technical barrier to proliferation in today's world..." That is why complete elimination of nuclear weapons usable materials is a necessary condition for achieving both nuclear non-proliferation and nuclear disarmament goals.

Based on articles by Matthew L. Wald & Michael R. Gordon in Times of India, Arjun Makhijani Science for Democratic Action Vol. 3 No.2 Special Thanks to Dr Egghead Science for Democratic Action Vol. 3 No.2 for the feature It Pays to Increase Your Jargon Power



The Global Supermarket

lethal Privatisation Off Nuclear Trade

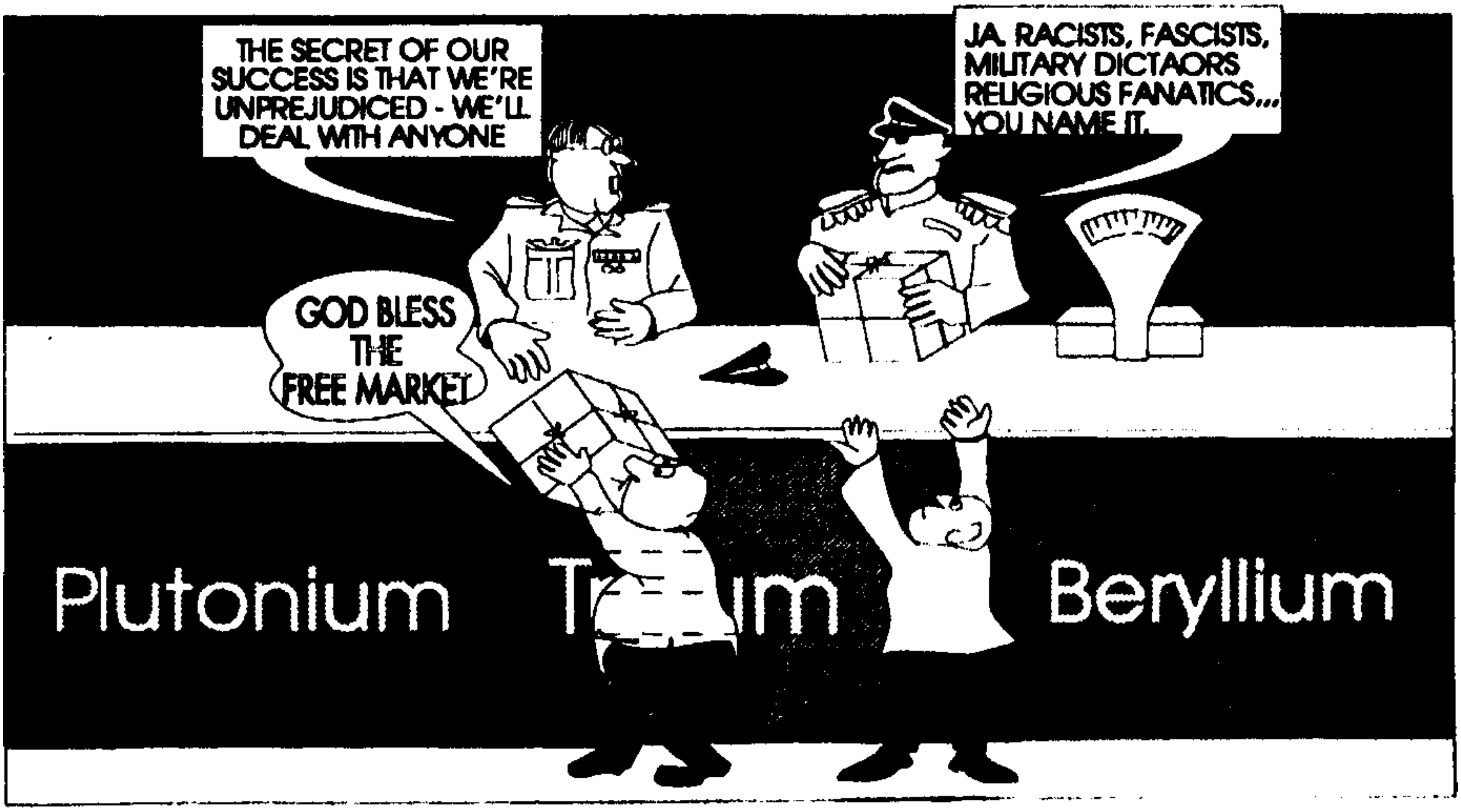
A Pakistani national is suspected by the German authorities to be involved in the smuggling of plutonium out of Russia. Indian newspapers and parliamentarians think this proves that the Pakistan government is building up a clandestine nuclear arsenal, and have expressed outrage. Long articles have been written about Pakistan's record of nuclear smuggling or theft.

I fear this loud condemnation of Islamabad may be misplaced, and that we may be ignoring an indefinitely bigger danger. We do not have the full picture yet, but for all we know the smuggled plutonium may have been paid for not by the Pakistan government but by terrorist groups in Pakistan. For all we know, the plutonium may have been destined for Dawood Ibrahim, or for Islamic groups wanting to overthrow the Rabbani government in Afghanistan, or wanting India to give up Kashmir.

For many reasons, I find it infinitely more frightening to contemplate plutonium with terrorists than with the Pakistan government. First, the Pakistan government already has nuclear weapons, and adding a few kilos to its arsenal makes little difference. Second, Pakistan can be deterred from using its arsenal by India's own nuclear power.

But if plutonium ends up with terrorist groups, they will constitute a new source of danger, over and above anything we face from Pakistan. More serious, it is impossible to deter a terrorist group with our own nuclear weapons. We can target our nuclear weapons at Pakistani military bases, but have no way of targeting individuals or groups. Finally, terrorist are far more fanatical and impervious to persuasion or international pressure than governments, and so will be far more reckless in their use of nuclear materials than Islamabad.

So I hope and pray that the plutonium being smuggled out of Russia is indeed going to the Pakistan government, and not to terrorist or underworld groups. I find it quite comic that supposed intellectuals are indignant at the prospect of the Pakistan government adding a few irrelevant kilos to its arsenal. Smuggling fissile material out of the ex-soviet Union is rife, and I would be extremely happy if the entire amount is purchase by the Pakistan government, for that will ensure that the material does not end up in the


THE SECRET OF OUR SUCCESS IS THAT WE'RE UNPREJUDICED - WE'LL DEAL WITH ANYONE
JA. RACISTS, FASCISTS, MILITARY DICTAORS RELIGIOUS FANATICS... YOU NAME IT.
GOD BLESS THE FREE MARKET
Plutonium
Beryllium

Come One Come All

hands of terrorists. Indeed, I would almost be willing to offer Pakistan a subsidy for the purpose.

Some people argue that the Pakistan government may pass on nuclear materials to terrorists. No nuclear government has ever done so, and I doubt if Pakistan will, since it is vulnerable to economic and diplomatic sanctions by western powers. (Editor's Note: I agree with the author's conclusion that it is doubtful that Pakistan will pass on nuclear material to terrorists, though not with his reasons for coming to this conclusion. It is not the vulnerability to western economic sanctions that makes governments take the straight and narrow path but sheer self-interest: terrorism is a two edged sword and can very easily bite the hand that feeds it. India has enough first hand experience of this with LTTE in Sri Lanka.)

It is not difficult for any skilled group to assemble a bomb once it acquires bomb-grade uranium or plutonium. A crude terrorist bomb weighs no more than one tonne, and be detonated by remote control. It will be small enough to be concealed and carried in a small truck or jeep to any site.

The thought is frightening, the Bombay blasts of March 1993 used RDX as explosives. If plutonium leaks to terrorists, the next blasts may be nuclear. Every time there is a communal riot, we could see nuclear blasts as the culmination of the frenzy, a new horror to add to other horrors. In a worst-case scenario, the acquisition of nuclear material by Muslim terrorists could be followed by a similar acquisition by Hindu fundamentalist groups, and that would be the end of the Indian state as we know it. This is, of course, an extreme scenario, but looking at the worst possible outcome is an important way of analysing the dangers of a situation.

Fissile materials need not be exploded to cause damage. Plutonium is extremely toxic, and even microscopic quantities can maim and kill people. A few kilos of plutonium would not be enough to make a bomb, but would be enough to poison the water supply of Bombay or Delhi, and maim or kill lakhs.

Why are leakages from Russia so widespread ? Because, as a nuclear weapons' power, it is not subject to international inspection. There is an urgent need to expand such inspection to cover all nuclear powers, including the USA. Leaks from US facilities are not entirely unknown. Even with universal inspection, some leakages will still take place. But the greater the vigilance, the smaller will be the leakages and the less the danger.

Left-wing comrades in India are terrified at the possible privatisation of government monopolies in industry. I am terrified by the possible de facto privatisation of nukes and violence. A civil society bestows a monopoly of force and weapons on its elected government, which alone can use weapons or force against individuals, in accordance with the laws of the land. This monopoly of force is sometimes misused. But it must not be replaced by free trade in violence and weapons, that way lies anarchy and oppression.

by Swaminathan S. Anklesaria Aiyar. The Sunday Times of India, August 21,1994.

The 40-year lie

On March 1,1954, at Bikini Atoll—a curving string of several dozen tiny islands looping gracefully around a 24 mile long lagoon—the United States tested its first deliverable hydrogen bomb. That test—Bravo—was the most destructive nuclear test in U.S. history. With an explosive force equal to nearly 1,000 Hiroshima-type bombs, it vaporised the test island and parts of two others and left a mile-wide crater in the lagoon floor.

In 1954, Bikini was one of the 29 atolls and five islands comprising the Marshall Islands, a United Nations trusteeship administered by the U.S. Department of the Interior. Although the total land area of the Marshalls is only about 70 square miles, they are scattered over 357,000 square miles of the Pacific. Two of the atolls—Bikini and Enewetak—were used for 66 nuclear tests, from 1946 to 1958.

The greatest irony of the Bravo shot was the decision not to evacuate any Marshallese. For Operation Crossroads, (a series of nuclear tests conducted on the same islands eight years earlier), the navy had evacuated the Marshallese living on Bikini as well as the three inhabited atolls closest to Bikini—Rongelap, Wotho and Enewetak. The tests during Operation Crossroads had not imperilled the other atolls, although they had seriously contaminated Bikini's lagoon.

Thus, in 1953, when the navy suggested an even more expansive danger zone for the Bravo shot and removing people from Rongelap, Interior Department officials balked. The 167 men, women and children removed from Bikini had never been permitted to return. Now High Commissioner Elbert D. Thomas, the highest ranking U.S. official in Micronesia, was reluctant to displace more Marshallese.

Their reaction to an enlargement of the area of activity will be apprehension, and fear that future externsions may place any of them in the same homeless position as the Bikini people now occupy," Thomas wrote his superiors at Interior. Evacuation would result in a "lowering of morale."

The Atomic Energy Commission agreed with Interior, and the results were tragic. For an atomic bomb the size of those dropped on Hiroshima and Nagasaki, the U.S. Navy had evacuated Marshallese for hundreds of miles to the east, west and south of Bikini. For a hydrogen bomb in 1954 that the government knew would be at least 400-500 times more powerful, no one was evacuated from these atolls. As a result, some 236 inhabitants of Rongelap and Utrik atolls, as well as 28 American servicemen on Rongerik Atoll and 23 crewmen on a Japanese fishing vessel, the Lucky Dragon, were sprinkled with fallout from Bravo.

Ever since March 1,1954, the U.S. government has explained that there was an unexpected "shift of the winds occurring after the detonation" that carried radioactive fallout from Bravo eastward over Bikini as well as over Rongelap, Utrik and other atolls in the Marshall Islands.

We now know that this was not true. The shot was deliberately set off despite the fact that government officiate knew exactly which way the winds were headed. According to a series of now-declassified for-the-record memos, the weather briefing at 7 a.m. February 28, the day before the shot, predicted "no significant fallout ... for populated Marshall Islands." But later in the day, "the **trend was toward an unfavourable or marginal condition." By 6 p.m., "conditions were getting less favourable."**

> *"It should be noted that no test is done without a specific purpose in mind, and at no time was the testing out of control."*
>
> *Admiral Lewis Strauss at 'Bravo' press conference 30th March, 1954*

The midnight briefing, less than seven hours before the shot, showed "less favourable winds at 10,000- to 25,000-feet levels." Winds at 20,000 feet "were headed for Rongelap to the east" and "it was recognised that both Bikini and Eneman Islands (east of the shot island) would probably be contaminated."

Following the midnight briefing, Bikinis weather outlook was downgraded to unfavourable, and Joint Task Force Seven ordered several of its ships to move 20 miles farther out to sea and to the south, to get out of the path of the fallout.

This evidence puts Bravo in a different category from an "unexpected wind shift." Some of the Americans were moved out of harm's way. But the "native" were left in place downwind. If the weather forecast created enough risk to move the ships, either the Marshallese in danger should have been also moved or the shot should have been postponed.

Following the shot, Atomic Energy Commission chairman, Lewis Strauss immediately opted for total secrecy, saying that "no public release will be made in regard to Call-out or evacuation in Trust Territory unless forced by leak or other circumstances."

Los Alamos test division leader Alvin Graves strongly objected to this policy. In an "Eyes Only" cable to the task force director of military application, Graves said he was "very concerned" about Strauses order. "I should regret very much the impression that we are being furtive in our actions with regard to these people." To no one's surprise Strauss prevailed.

Graves was right. The secrecy about the fallout exposure—and the later lies about a "wind shift"—were unconscionable acts, it is time for the U.S. government to apologise.

Jonathan M. Weisgall
Bulletin of Atomic Scientists
May/June 1994

The inhabited atolls of Rongelap and Utrik, some 100 and 300 miles east of Bikini were bathed in radioactive fallout. A pale powder coated Rongelap to the depth of one and half inches and Utrik was wrapped in radioactive mist. It was three days before U.S. Navy ships arrived to evacuate the residents. By then they were experiencing a range of symptoms: nausea, burnt skin, diarrhoea, headaches, eye pains, numbness and general fatigue. They also suffered a lowering of the blood cell levels, especially the white and T-cells, which form a major part of the body's immune system. Their fingernails came off, their fingers were bleeding and their hair was falling out. The exact dose of radiation that the 236 islanders received was never measured, but it is estimated at 11 rem per person on Utrik and 190 rem on Rongelap. (For comparison, the average dose per person received after the Chernobyl accident to residents living nearby was estimated to be 12 rems.)

"Greater knowledge of radiation effects on human beings is badly needed ... Even though the radioactive contamination of Rongelap Island is considered perfectly safe for human habitation, the levels of activity are higher than those found in other inhabited locations in the world. The habitation of these people on the island will afford most valuable ecological radiation data on human beingss."

The Rongelapese now suffer from high rates of malignancies and reproductive problems, all directly associated with radioactive fallout. The Marshall Islanders have one of the highest rates of diabetes in the world. They are also suffering from psychological phobias as the result of uncertainties about their future.

The Brookhaven scientists allowed the Rongelapese, including some who had not been exposed to the effects of Bravo originally, back to their islands in July 1957, declaring the atoll to be safe, despite 'slight lingering radiation'. There had been no radiological clean-up.

From Greenpeace Book of the Nuclear Age

The Economy off Nuclear Security

Stuck in a relationship of conflict, that has led in the past to three wars, security issues loom large for the governments of India and Pakistan. Being poor countries they want "cheap security", and now many of their policy makers seem to think that nuclear weapons can provide just that. But nuclear weapons have never provided cheap security and cannot do so for India or Pakistan. Nuclear weapons systems are neither cheap to develop, nor do they allow large reductions in conventional military forces.

Since both governments already claim to have some kind of "nuclear capability", it could be argued that the huge sums involved in developing such weapons have been spent already, so what is the point of crying over it now? Nuclear weapons are more than just "things" , like one buys from a shop. They are part of the search for "nuclear security". The setting up of a nuclear weapon's programme marks the beginning of this process, not its end.

The pursuit of "nuclear security" creates a sense of "insecurity" in others, which they try to overcome. A simple example of this is the rationale offered for Pakistan's nuclear weapons programme. It is supposed to be a response to India's nuclear programme, which was claimed, in turn, to be a response to the Chinese programme. The competitive dimension is common to all attempts to create security by military means, nuclear and non-nuclear. It follows from the strategic notion of "deterrence" which is not peculiar to nuclear strategies, but has been associated with weapons throughout history; in fact from the time the first caveman with his stone-axe decided if his neighbour also had a stone-axe, he needed a spear and in time a bow and arrow, guns, tanks nuclear bombs. This process is driven by pressures that are brought into being as soon as the first step is taken.

The logic of deterrence says a nation always has to be prepared to fight. There is, therefore, a great deal of importance attached to being ready to fight a war, at any moment. Deterrence theorists argue this "readiness" defers the outbreak of war. But they fail to understand this "readiness" not only undermines any effort to prevent crises from developing in the first place, it also becomes increasingly costly.

A former chairman of Pakistan's Atomic Energy Commission has already observed "all weapons systems, including nuclear devices, lose their effectiveness over time. New technological advances render them obsolete." This implied, to him, that "defence preparedness has to be rene wed and upgraded year after year." However, the open-ended and unlimited renewal and improvement of "defence preparedness" is certain to claim scarce resources "year after year". An apt analogy is heroin addiction; the victim spends more and more time, effort, and of course money "chasing the dragon".

How severe nuclear addiction can be is evident from the experience of nuclear junkies that have already travelled this road. The US started with two atomic bombs, which destroyed the two Japanese cities of Hiroshima and Nagasaki in 1946. In 1947 they wanted three bombs to use on Soviet cities, by 1949 they wanted 220, and by 1960 they had 18,000 nuclear weapons in their arsenal.

The types of nuclear weapons also increased, ranging from bombs that weighed less than 50 kg to those weighing several tonnes. The destructive power available increased enormously when, following the Soviet nuclear test-explosion in 1949, the US detonated the first hydrogen bomb in 1952- a feat which the Soviets duplicated within a few years.

The delivery systems for nuclear weapons increased not only in number but in their range and in sophistication. There are long-range bomber aircraft, nuclear artillery shells, short range intermediate range and intercontinental ballistic missiles, that can be launched from silos on land or from submarines, and now cruise missiles that can be launched from aircraft, shops and even from a truck. What has increased throughout is the speed, complexity and lethality of the weapons system taken as a whole.

Should anyone want to argue that this is a specifically superpower experience, they will firstly have to explain why Britain, France and China did not stop their weapons programmes when they had built atomic bombs. All these nuclear weapon states went on to build hydrogen bombs, missiles, submarines, and so on. There are signs that the next stage of competitive escalation has already begun in South Asia; it is widely believed that Indian bomb-designers have been working on a hydrogen bomb, and there is probably a similar team somewhere in Pakistan, desperately trying to catch up. If Pakistan's military planners were ever foolish enough to explode an atomic bomb as a test (and as a demonstration) then India's would almost certainly respond with a nuclear-test aimed at developing their hydrogen bomb.

Given that India and Pakistan are developing missiles and trying to buy submarines, clearly they are not immune to the escalation that comes from the logic of "deterrence". Even the prime minister (Benazir Bhutto) has recognised this when she referred to "fears" of an "arms race" and "huge defence establishments". Why she thinks these are still "fears", something that may happen rather than something that is already happening, is a question someone should ask her when it comes to preparing the defence budget. In her address to the National Defence College (March 17, 1994) she seems to return to the pattern of deterrence: "This is my promise to you: come what may we shall get the weapons of tomorrow. It shall not be our fate to live in perpetual fear of predatory neighbours brandishing hi-tech weapons."

All nuclear weapons, irrespective of who they belong to, once designed and assembled, have to be tested, inspected and maintained. For Pakistan or India to think about deploying their nuclear weapons, rather than just talking about them, or sitting on them without knowing if they are safe and reliable, makes such procedures absolutely indispensable. A nuclear test is more than setting off a bomb in a hole in the ground. It is actually a very complex scientific experiment, and doing an experiment just once is bad science. A typical series of nuclear weapons tests in the early days of the US nuclear programme consisted of 20 test explosions for each weapon design. These tests are not cheap; the current cost for one simple underground test explosion is $ 30 million. The US Department of Energy has requested $ 428 million for 1994, just to maintain the infrastructure and capability required for nuclear testing. But these are the least of the costs associated with nuclear weapons testing.

The real consequences of nuclear weapons testing are to be found in large areas of Nevada and Kazakhstan. These areas, described as "National Sacrifice Zones" by US officials have become unfit for human habitation as a result of these test-explosions. In both areas there is radiation in the soil, in the food and in the water. Farmers commonly find that their livestock give birth to "monstrous offspring", others just die "mysteriously". In Kazakhstan, milk in the area has 500 times the officially acceptable amount of radioactivity in it.

It is the local people who are the worst suffers. Around the Nevada test site, people now suffer from "cumulative cancers, neurological disorders, and genetic defects". Cancer is common that almost everyone living there can recall "long lists of tumours or deceased friends and relatives". Eyewitnesses have described people whose "hair was falling out and their skins seemed to be peeling off. And then there are the "jellyfish babies", born to women living in these areas; women who after six months of pregnancy, give birth to what "looked like a bunch of peeled grapes".

It does little good to detonate the test explosions underground. One

Nuclear weapons have never provided cheap security and cannot do so for India or Pakistan. The social costs of pursuing such "security" are evident in the schools, hospitals, roads, water and sewage systems that could have been built, but were not built. The money has obviously been there to be spent, but has, instead, been wasted on chasing the nuclear dragon, whose fire may consume both nations.

ANUMUKTI IS SEVEN

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out of every three underground Soviet tests threw radioactive dust and gas into the atmosphere. In about 30 tests these clouds were blown by the wind outside the test area into populated regions. The incidence of leukaemia has more than doubled in this area where more than 95 % of the children suffer from anaemia. The Soviet obsession with secrecy meant that "people living in this area died slow and horrible deaths from unknown illnesses—diagnosing radiation related illnesses was forbidden." As many as 500,000 people are believed to have been affected by radiation from the Soviet nuclear blasts in Kazakhstan.

The situation is little better in the US. An unpublished government report prepared during the 1970s estimated that 175,000 people had been poisoned with radioactivity, nearly everyone living within 250 miles of the Nevada test site. A further 250,000 US soldiers may have been exposed to radioactivity by US nuclear bomb tests, while as many as a million people have actually worked in the nuclear weapons plants. Ill-health among these workers is increasingly being linked to their jobs.

The intensely radioactive materials that form the core of nuclear weapons make the bomb-factories so contaminated that, in time, they become unusable. As a result of safety and environmental problems in such plants in the US does not have the capacity to make nuclear bombs. The cost of clean-up are staggering. It is estimated that to clean up just the Hanford nuclear facility in the US, described as the "dirtiest place on earth", will cost at least US $ 150 billion, the real costs may be much higher. What is already clear is that $ 8 Billion have already been spent on this with "little to show".

How badly do the people of Pakistan need "nuclear security"? How much are they willing or able to pay? The social costs of pursuing such "security" are evident to everyone, especially in the lost opportunities, the schools, hospitals roads, water and sewage systems that could have been built, the lives immeasurably improved, by deploying the same capital investment. This money has obviously been there to be spent, but has, instead, been wasted on chasing the nuclear dragon, whose fire may consume the nation. But it has to be said that nuclear weapons are only part of a larger story. There are the hundreds of thousands of men, hundreds of tanks, dozens of F-16s, submarines and frigates, as well as nuclear weapons and missiles. The larger story is about a society that is obsessed with war, that does not believe it can ever know peace.

Dr. Zia Mian
Sustainable Develop. Policy Inst. Islamabad.
The News March 19, 1994

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ANUMUKTI

A Journal Devoted to Non—Nuclear India

Volume 8 Number 2 October / November 1994

A Tale off Two Cities

Take two twinned European cities, Freiburg, on the edge of the Black Forest in south-west Germany, and Guildford in Surrey, England, both prosperous regional centres on the edge of fine countryside. Each has a medieval core, and expanding university, a cathedral, theatre, and castle. Heavy industry has hardly touched either city.

Guildford - how to put this kindly - throbs. Its city centre has been brutalised for twenty years by massive developments, and is a chaos for cars, one-way systems, and thunderous traffic. Pedestrians queue for minutes to be given nine seconds to cross the road. There are cyclists in Surrey but they have no human form in Guildford. The only "pedestrianised" street ia open to rush-hour traffic. Car culture rules.

Where Guildford hurries and bustles in its chaotic way, Freiburg purrs like a smug BMW. The perfectly preserved medieval city centre is spooky. Where are all the cars? One whole square kilometre of the city has been pedestrianised (this will be increased soon) and only orderly trams, bicyclists, and walkers glide over the cobbles. A vast open-air market offers a cornucopia of local produce. It is as packed as Guildford's many supermarkets.

To go from most British cities to Freiburg is to be shocked. You can walk all day around this city and talk and think quietly. You need never see or smell a car, or hear much more than cathedral bells. And Freiburg is twice Guildford's size.

Behind this superficial impression of the two cities lie two approaches to local government. As a local officer in Guildford points out, British cities are legally and financially constrained, confined to a narrow range of tasks allocated them by central government. Guildford cannot run its own buses or its own electricity company. It cannot ban heavy traffic, but it can commission traffic reports.

German cities can raise their own taxes, control their own utility companies, run their own transport networks. Ironically, it was the British occupation authorities after the war who allowed German cities these freedoms.

Freiburg was once an ordinary city of 200,000 inhabitants and really congested traffic. Then a few streets were made car-free. Some of the shopkeepers complained but most of them found that their trade increased, and soon people wanted to ban cars from still more streets. And so it started. Freiburg has since advanced step by step to becoming a model of environmental development, a city that is attracting study visits from practically all over the world.

German cities enjoy considerable autonomy. Freiburg has been able for instance to use its profits from the sale of energy and water to subsidise public transport by as much as 40 per cent. In 1966 it also allowed the municipal tram and railway company to reduce the price of season tickets by 30 per cent in order to provide an incentive for people to use such transport. A year later 23 per cent of the car users had gone over to travelling publicly and using an "environmental pass," valid for ninety tram, bus, and train lines run by 14 authorities. There was no loss of revenue.

In 1991 the pass was made applicable for all public transportation companies in the region - which meant for 2,600 kilometres of track -as well as German federal railway, and more people switched to public transport. Simultaneously with an extension of pedestrianisation, 400 kilometres of cycle paths were being laid parallel to 65 per cent of the city's roads. Now 26 per cent of all journeys are made by public transport, and 27 per cent by bicycle. It is hoped, too, that private car travel will fall to 33 per cent.

Stiff parking charges, reduced parking spaces, a 30 kph speed limit in the suburbs, and traffic calming on the edge of all residential areas, combined with further investment in the tramway system, have over the past fifteen years cut down car traffic within the city boundaries by almost 20 per cent, as well as reducing accidents by 25 per cent.

Frieburg has done more than deal with traffic. Time-variable charges have helped reduce electricity consumption, and a new heat-and-power scheme, scheduled for completion in 1996, is expected to reduce emissions of carbon dioxide by 20,000 tonnes. Frieburg seems well on its way to fulfilling its aim of becoming the most attractive city in Europe. It has in fact become so popular that it is already having to build a suburb for 10,000 people - naturally an environmentally advanced one, too.

John Vidal in The Guardian
taken from a condensation in
Acid News.

From The

Beating the Retreat

I remember in my childhood being taken nearly every year without fail to witness "beating the retreat'. There, we would all be seated on durries in front of the Central Secretariat with V.LP.s seated on chairs at our backs and army bands marching in front. Jawaharlal Nehru would be there and if he had time, he would be playing with us children in 'our' enclosure. And then as the Sun went down behind the towers and ramparts of Luyten's Delhi, the buglers and the drummers would play and the flags would be lowered. The inheritors of British India had inherited not only the raj but the trappings of the raj as well.

The technocrats who adorn the corridors of power in Delhi today probably have no use for such ceremonies to commemorate real events. They prefer to be businesslike and use press briefings. But the drums and bugles which sound the retreat have an unmistakable sound and that sound is discernible even in the dry surroundings of a press note. It is a sweet sound.

Dainik Navjyoti—a Hindi daily from Kota, carried the confirmation:

"The Central Government has given up the idea of building a nuclear complex at Rawatbhata. In addition to the two "working" reactors and two under construction, four units of 500 MW each was planned at the site.

"A spokesperson of the PM's Office, Mr. Bhuvanesh Chaturvedi, told the UNI that Units 3 and 4 of 235 MW each, are expected to be completed one year before the scheduled dated. But the Centre will refuse clearance for Units 5 to 8. Nuclear Power Corporation had asked for permission from the concerned central ministries for its plans to construct four units of 500 MW each.

Is Anumukti and the dream for a non-nuclear India round the corner? Unfortunately no. This is a strategic retreat. Not a change of heart. The reasons which have prompted the power brokers of Delhi to go slower down the path of atomic doom have to do more with inefficiency and unreliability of the atomic enterprise. They are sick of the fact that despite huge infusions of money and talent, nuclear facilities in the country have remained 'sick' units with brand new plants like Kakrapar and Narora having a worse production record in the last two years than twenty-five year old plants like Tarapur. But the disillusionment with the nuclear dream is not with the vision itself. A revival of nuclear fortunes in India is certainly possible especially if foreign nuclear manufacturing firms make a concerted bid in a changed political climate. The task for antinuclear groups is to educate the public regarding nuclear reality, so that the price of any revival becomes unacceptably high for any domestic or foreign dream merchant.

Some Impressions of Surat During the Plague

Surat is the fastest growing city in India. Diamonds and textiles are the two pillars of its prosperity. Out of a population of 2.2 million a majority are outsiders. Half a million from Orissa alone and a larger number from Saurashtra, with substantial contribution from Maharashtra, Rajasthan, Andhra Pradesh, Madhya Pradesh and Uttar Pradesh. The old Surtis have prospered and spread all over, from Bombay and Ahmedabad to New Jersey and California. Since the growth of Surat is a very recent phenomena, most of the old town residents retain small town character: everybody knows everybody else, people are helpful and share each others joys and sorrows.

The demolition of the Babari Masjid in Ayodhya led to a prolonged bout of communal violence in Surat. Many ran away and the industry in Surat took months to recover from that shock. But even that disaster pales in comparison with what has happened this year. In July, three lakh people especially from Saurashtra left because some tantrie said that the Ukai dam on the river Tapti would collapse on the seventh day of the seventh month at seven O'clock. Transporters made windfall profits with seats which normally cost Rs. 100 selling for four times the amount. While those who stayed were still laughing at the gullibility of those who left, it seemed that the tantrik would have the last laugh with floods in the river and the Ukai dam tethering on the edge. Although a number of areas of the city were under water, nobody left Surat on account of floods. Those effected moved to higher ground and were helped by voluntary and government efforts. And then within just 15 days, there was (is) the plague. On hindsight the first indications were reports of stray deaths of unknown causes.

Dead Body Found Near Chowk Bazaar State Bank

Surat 20th September, 1994

An unknown young male was found dead at 5.30 P.M. from the footpath in front of the State Bank of India in Chowk Bazaar. It is worth recalling here another dead body of a young man with blood on the face was found near the octroi checkpoint on Palanpur Road. Although more than 48 hours have passed since that happened, the Rander police have yet not been able to identify the victim. However, the new discovery of another bleeding body of a youth have stirred the Athwa Lines police.

Blood was dripping from the nose and mouth of the dead man. P.S.I. Mr. Veerpur examined the body. According to police sources Rupees 1745 was found from the pocket of the youth. A diary belonging to Mukesh Vinubhai was also found. There was a prescription issued by Dr. Manubhai M, Vaghasia of Jai Bhavani Society, Varacha Road.

Dr. Vaghasia on being contacted said that on 18.9.'94, a vegetable vendor who gave his name as Jagdish Dharma had come to his clinic. He had a cold and cough and was suffering from a little fever. After taking medicine this person had not returned for a second visit. The police confirmed that the prescription found in the youths pocket was in the name of Jagdish.

There is a tattoo of the 'love' sign on the chest of the dead man. The police are still in two minds regarding the name of the youth. The body has been sent to New Civil Hospital for post mortem examination.

New Gujarat Times 21.9.1994

Lone Ranger Rides Again

We (Sanghamitra and I) decided to go to Surat on the spur of the moment. There had been number of phone calk from friends here and abroad, worried about our safety and we had reassured them that Vedchhi was far away from Surat. Shri Narendra Zhaveri, a prominent Sarvodaya activist had phoned and asked for three hundred volunteers to undertake cleaning activity in Surat. Sanghamitra had tried to organise this team but the dread of the word 'plague' was such that less than ten people volunteered. But then the collector of Surat had saved us from the embarrassment of having to admit to our inability to help by prohibiting outsiders from coming.

The Center for Disease Control in Atlanta and World Health Organisation together have developed a computer programme called EPI-INFO 6 for analysis of epidemiological data. We had used a previous version of this programme for analysing the Rawatbhata survey data. During the plague crisis, our mail was badly disrupted. But, as luck would have it, we got mail just one day and in it was the new version of the programme. I took it as an omen.

Sanghamitra was reading aloud a strong editorial in Gujarat Mitra which condemned the attitude of doctors who had run away during the crises. Suddenly I felt that we ought to go ourselves and see what help we could render. The rains have made the Vedchhi - Surat road an ideal track for all who wish to take up cross-country motorcycle rallying as a profession, Though not part of this fraternity, we took off on our motorcycle so that we could have extra mobility in case of need in Surat.

The ride was adventurous to say the least. Potholes were large enough for elephants to disappear without trace. But what made the ride most memorable, was the site of masked men on motorcycles. They revived long forgotten images of the 'Wild West' I had formed in childhood by assiduous reading of illustrated comics. But it wasn't all just a kerchief around one's face. Far from it. Plague has led to a flowering of a whole range of fashion in masks. The artistic creativity and the innate business sense of Surtis has found combined expression in mask design. Politicians both local and national, who have come in plenty to get themselves photographed have favoured the sombre 'medical' mask while bureaucrats have preferred a multicoloured contraption which looks as if there was an old microphone taped permanently to their mouth in which they can bark orders. Some have gone in for the 'atomic' look—a mask with a long snout like one seen in advertisement pictures of nuclear workers working in contaminated environments while others have preferred the space walkers helmet. As we were nearing Surat, a car crossed us with all the windows drawn shut and four occupants all wearing blue coloured velvet masks. Even while running away with one's tail firmly tucked in, the jet-set does it in style.

Rumours Galore

We went to Narendrabhai Zhaveri's house. Friends in Bombay had sent a huge stock of tetracycline packed in large bags and the whole family was engaged in making small packets containing 40 tablets each so that they could be distributed easily. They had already been to the worst affected area—the slums around Ved Road—and had talked to residents, identified suspected patients and persuaded them to go to the civil hospital, and distributed drugs to the relatives who needed to both go to the hospital and take care of the family at home.

Everyone we met in Surat was eager to talk about the night it all began. 'The telephone was ringing the whole night." There was a rumour that the water supply had been poisoned and everybody was telling friends and relatives not to drink the water from the municipal supply. Dr, Minoobhai Parabia had the funniest experience. At three O'clock in the morning he was awakened by the phone which turned out to be a wrong number. But the caller hadn't hung up. 'The water is poisoned. Don't drink it." "But I and also my children have been drinking the water from the tap during the night and nothing has happened to any one of us.""Never mind, just listen to what I say. DON'T DRINK THE WATER."

Their Finest Hour

The South Gujarat Chamber of Commerce had set up a control room which would gather the latest information regarding hospital admission figures, deaths etc. and help disseminate this to the public. Manned entirely by enthusiastic volunteers, it provided a fine example of what voluntary effort can achieve in contrast to the fear stricken immobility of official bodies. Quite often, Nikunjbhai Desai and Nikhil Madrasi, the control room volunteers had to deal with unexpected situations.

A woman's voice: "Hello is that the control centre? Could you please tell me how many patients from Udhana have died since yesterday.?"
'Well, nobody from Udhana in today's list, Till now a total of 42 people have died. Mostly they are from Ved Road and Katargam areas. A total of 436 patients have been admitted till now but I don't have an area-wise break-up for those."
"I live in this society building and I am all alone. Everybody else from our society has run away. I am feeling afraid. What will happen to me?"

'There is a dead pig lying on the street in front of our house. How to getridofitr
"Why don't you try burning it. Just pour a bit of petrol or kerosene and light it. Once it catches fire it would burn because it has a lot of fat in it."
"It is a pig. Who knows there might be a communal riot if one burns it. Can't you get some corporation guy to come and get rid of it."
Hold on a minute, I will try them on the other phone. Hello, is that the Solid Waste Management Department? There is a dead pig at...
"What can I do if there is a dead pig? There is nobody here."
"Well, the first thing you can do is to note down the address. And the next thing would be to send somebody down there whenever available. Now tell me when can your person go there?"
"Hello, are you still there? A person will come around 10.30 tomorrow morning for the pig."
'Tomorrow morning ! Man it is a dead pig and it is stinking. Can't you do something right now?"
No, I can't do anything better from here. But you can do something. Burn it."

The Best of Times The Worst of Times

Estimates vary of the number of people who migrated out from Surat during the scare. Some say 3 lakhs, others 8 lakhs. Doctors were universally condemned for their lack of 'courage'. However, amongst this group of deserters were a lot of quacks who masquerade as doctors. But it wasn't only the doctors who made a bee-line out of Surat. Government officials were no lees fleet-footed. The District Information Centre is a fully computerised set-up meant to provide up-to-the-minute data. We went there to get census information regarding Surat, that would help us in our statistical analysis regarding the spread of the disease. The door was open and lights and fan were on and on a desk by the side of the wall were a set of computers, but there was nobody in. We waited for a few minutes for somebody to turn up and then went to an adjoining office, where one person was working. 'Dh, nobody has come to that office for the last three days. The officer, Mr Chavda, is from Saurashtra and has probably gone there. Come next week or may be the one after that and you might get what you seek."

Those who did not give way to panic and stayed were usually, full of good cheer and extremely helpful. We wanted access to a computer with a three and a half inch floppy drive. Within an hour, we had a choice of four computers in different parts of the city and Mr Gelani a computer shop owner drove miles at ten O'clock in the night to get us the required floppy drive. But getting a room where one could work undisturbed was a bigger problem. Dr, Girish Shah, whom we just met at the control centre, solved the matter by calling his friends at Arun Printing Press. "Dr. Gadekar has come to help us organise the plague data. You will not only allow him to use the computer but the telephone as well and also feed him." But Kalpeshbhai at the press went far further. "Anything you want printed, just tell me. The press is closed at the moment because my workers are absconding but for you I will operate it myself. I offered the District Commissioner to print any amount of plague related material free of cost on my own paper, but those guys don't want any 'outside' help."

An Attitude off Distrust

The establishment distrust of voluntary efforts was palpable. A number of private doctors told us that, "We have offered the civil medical authorities any help they want, but the answer is always the same. No, thank you. We dont want you here. We are quite capable of taking care of this problem ourselves." Even efforts by organisations such as the Jaycees to send food for junior doctors and nursing staff who had been put on eight-hour-on eight-hour-off shift, were rebuffed.

There were only three persons who reported for work in the Preventive and Social Medicine Department. Dr. Vikasben Desai was one of them. "If you want we can give you a copy of "the EPI-INFO programme. We can also help with the data entry." "Research is not done by getting emotional. Let this thing die down and then there will be plenty of time for doing research. I have ordered a computer. But it needs copper wiring. This 3 metre portion has not been wired still. And now, with the plague, I don't know when the person who does the wiring will come."

Rule Britannia

Any suspected case of plague was required to report to the New Civil Hospital. During the first few days after the scare, there was absolute anarchy A number of patients some of whom were seriously sick and many who were not, had simply absconded when transferred to the plague wards. The press had reported all this. However, by the time we went to Surat, order had supposedly been restored. There were hefty men in blue and brown camouflaged suits all over the place and the entry of journalists had been 'banned'. The first sight that greeted us at the hospital was that of a foreign photographer bent over her camera and these guards ordering patients seeking admission to stand in a group, so that she could get the 'shot' she wanted.

The Greatest Need

The most vulnerable group were the relatives of patients. They were not only looking after the patients but were also going back and forth between their homes and the hospital for cooking and taking care of the family there. Most of them had not been told at all of the risks they faced or what they ought and ought not to do. At the time we went, they had received just two tablets of tetracycline which they had not taken themselves but had given them to their young children at home in the hope that the medicine would produce immunity. Just talking with these people and listening to their woes was the first thing that we did. It was by doing this that we realised the need for doing a proper survey so that one could acquire a better understanding of the course and spread of the disease and its response to the various drugs being used.

The 'junior' doctors who were actually looking after the patients were enthusiastic about the survey and helped us prepare a questionnaire. Kalpeshbhai at the press got it printed in a jiffy and by the next day we had also assembled a team of volunteers who would talk individually to the relatives of the patients and fill out the questionnaire. That is when our problems began.

'Senior' doctors were unenthusiastic about the whole project, but nobody wanted to tell us to quit. Finally, we were directed to the head of the medicine department, Dr. Parmar. "I feel this work should be done but my hands are tied. From 12 O'clock today there will be military rule in the hospital and nobody would be allowed inside without the express permission of Shri Bhanujan—the plague commissioner of Surat."

Shri Bhanujan had been posted to Surat after the outbreak of the epidemic and had tried to streamline the administration and take precautionary measures which ought to have been taken much earlier. He was 'out' on rounds most of the day but we managed to locate him in the evening. His first reaction was negative. 'I cannot allow you to unnecessarily risk your lives by talking to patients." However, he was quick to grasp the importance of doing what we were trying to do. *"I* know the administration. As soon as the scare is over all the papers will be filed and the whole thing will be forgotten. No lessons will be learnt. OK I will talk to Dr. Mehta, the hospital superintendent and let him decide on the modalities of allowing you to talk with the relatives of the patients."

However, when we returned to the hospital, Dr. Parmar vehemently opposed the whole idea, with the result that finally Dr. Mehta said to us that the hospital would provide us with the addresses of discharged patients and we could conduct our survey in their homes. This was an ironically funny statement because in most cases, the hospital had not bothered to collect the detailed address. Also it made no sense to study just the patients who had been 'cured'. Since there was no point in continuing with the exercise, we abandoned the whole project and returned to Vedchhi. We gave a copy of the programme to junior doctors and helped them computerise the woefully inadequate hospital records.

The last two months have been characterised by a controversy as to whether the infection was actually plague. The unscientific approach of the medical authorites and their total lack of concern regarding proper record keeping ensures that the controversy will continue.

Unpreparedness In Disaster Situations

Why have I devoted so much space in *Anumukti*—a journal presumably devoted to non-nuclear India to recollections about the plague? I feel that preparations for disaster management are non-existent in India and we are not learning any lessons from the disasters that are occurring with increasing frequency. The epidemic in Surat was an opportunity that could have been used to gain information which would have been useful in future disasters. Instead, it was used by many senior doctors merely as an opportunity to buy status-enhancing equipment like computers and intercom. It was a lucky thing that the infection was not very virulent and not many people died. God help us if we ever have a major nuclear accident.

Surendra Gadekar

How Come Tarapur Is Immune to Cracking?

As many as 10 US reactors have developed cracks in steel shrouds surrounding radioactive fuel, a problem the US Nuclear Regulatory Commission says could lead to a meltdown in case of an earthquake.

Cracks were first found last fall in a reactor in North Carolina, but industry officials expressed surprise at the number and the extent of the fractures found in recent inspections.

Seven US reactors have cracks and three showed indications of cracking, according to Boiling Water Reactors' Owners Group, a group of utilities that use the reactors. The Group also found indications of cracking at two reactors in Europe and China.

The cracks could point to problems in other reactor components and could lead to a meltdown if they shifted during an accident or natural disaster, such as an earthquake, and jammed control rods used to shutdown a reactor, NRC warned.

Anti-nuclear groups say a manor disaster could happen at any time, but the NRC and utilities contend that the public is in no immediate danger. "Are they safety problems? Yes, but not of any imminent nature," said Mr. Jan Strasma, an NRC spokesman. "It is difficult to project some force that could cause movement of the shroud." The shrouds are two-inch thick stainless steel cylinders that direct the flow of radioactive water around the fuel core.

Of the 108 working reactors in the US, 37 are of the boiling water type developed by General Electric in the late 1960s.

The two reactors at Tarapur, are the same General Electric made boiling-water reactors. In fact, in the words of an ex-chairman of the Department of Atomic Energy, "they are the oldest functioning reactors of their vintage'. DAE officials have categorically said that similar cracks have not been detected in the Tarapur reactors. The question that arises is the following: Is the absence of detection due to the fact that there are no cracks or is it due to faults in the detection process itself? According to the chairman of the Atomic Energy Regulatory Board, Dr. A. Gopalakrishnan, the cameras used for monitoring the surface of the shroud at Tarapur are not able to 'see' over 95% of the area of the shroud.

Rawatbhata Reactors Cause Worry

Atomic Energy of Canada Ltd. says it is worried that two Candu reactors at Rawatbhata could suffer serious accidents, but the agency's hands are ties because of a 20-year stand-off in nuclear relations between Ottawa and New Delhi.

In a letter to International Atomic Energy Agency in Vienna, AECL's president of the Candu division, Donald Lawson, said the reactors could suffer a loss of coolant accident, the same type of problem that beset the Three Mile Island reactor in March 1979 in the US.

Pressure tubes at the Indian reactors, according to data provided by Indian scientists, appear to be suffering from a condition known as liydride blisters," which could lead to a rupture and massive leaks of heavy water coolant. 'The condition in these reactors are such that there is a real potential for a pressure tube rupture to occur at any time," Lawson wrote.

The Candu reactor at Pickering in Ontario, Canada suffered such a burst in 1983 and was shut down for repairs that cost several hundred million dollars. Rawatbhata-1 has had the worst performance of all Candus and both the reactors have been rife with problems including reported radiation leaks. Canadian expertise was withdrawn from India since 1974, following India's explosion of a nuclear device.

India has expanded its nuclear programme by building clones of Candus. AECL spokesman Mac Keillor said Canadian experts would like to offer more assistance to India, but they are prevented by doing so because of the ban imposed by Ottawa on such aid unless India signs the NPT. The Indian government has denied any problems exist at the reactors, he said.

WISE News Communique 419

The State Electricity Boards Do Their Bit to Keep India Healthy

The Nuclear Power Corporation (NPC), the sole supplier of atomic power to state electricity boards (SEB) all over India, would have been richer by over Rs. 513 crores if the SEBs had all paid their dues on time. As it happens, they haven't for the past several years, bringing the total outstanding to Rs. 513.03 crores till April 30 this year, against a total power sales of Rs. 477.44 crores in 1992-93. (The figures for this year are not yet available.)

Confirming this, Mihir Mitra, director Environment and Public Awareness of NPC said tha.t while most state? were behind in their payments, the largest single defaulter was Rajasthan State Electricity Board with unpaid bills of Rs. 198.62 crores, though the state plays host to the Rajasthan Atomic Power Station.

Maharashtra too owes NPC a modest Rs 6.26 crores for electricity supplied partly by Tarapur Atomic Power Station and partly by Kakrapar Atomic Power Station. Mr Mitra said that some of the northern, states appeared most reluctant to pay their dues, because of which the worst sufferer is Narora Atomic Power Station with outstanding dues of Rs 286.14 crores. It supplies eight states including Uttar Pradesh, Punjab, Haryana, Himachal Pradesh and Jammu & Kashmir.

To make matters worse, the NPC as a whole is generating only half the amount of electricity it is capable of. According to an internal memo, all the NPC units put together are producing only 860 megawatts, though they have a capacity of 1620 megawatts.

NPC sources said this was because several major generating units are not working. Thus, NAPS-1 and KAPS-1 each having a capacity of 220 megawatts, have been shut down. The Narora unit has been inoperative for the past 15 months ever since a fire broke out in March 1993, while KAPS-1 is shut down for its annual maintenance needs. Also, unit-1 of RAPS of 200 megawatts capacity had to be closed down two months ago because of repeated leakage of heavy water from the overpressure release device which is supposed to prevent a dangerous build up of pressure inside the reactor vessel. Though there was no leakage of radioactivity from the unit, the Atomic Energy Regulatory Board (AERB) ordered it closed.

"Even if we were to restart it now, the AERB would allow us to operate it at 50 percent capacity. It may not be economically viable for us," Mitra said.

Sumit Ghoshal Indian Express
June 29,1994

Protest at Watts Bar

In 1925 in a small courtroom in rural Tennessee, USA, a teacher named John Scopes went on trial for the crime of teaching the theory evolution in school. Local and state authorities felt that teaching of evolution was an insult to the biblical account of creation.

Now nearly seventy years after the event, the same courtroom is again in the news with the biocentriste meeting the nuclear 'creator'.

The only nuclear plant still under construction in the US, the Watts Bar reactor in Eastern Tennessee has been under construction for the last 22 years. Those years have been pockmarked with delays, huge cost overruns, safety problems, and controversy. The Tennessee Valley Authority (TVA), owner of the plant now claims it will be operation sometime next year.

Not far from Watts Bar, in the Cherokee National Forest, Earth First's week long annual meeting, the Round River Rendezvous, was held in early July. Several hours before dawn on July 11, about 150 Earth First! campers travelled to Spring City, Tennessee, equipped with 35-feet long poles and six concrete-filled 55-gallon barrels, to erect a blockade in the main thoroughfare into the nuclear plant before 4,000 workers arrived. The crew raised the poles into a tripod putting a sitter 25 feet up in the middle of the four lane road, flanked by three barrels on each side. Blockaders plunged their arms elbow deep into a tube running through the middle of the barrels and lacked their arms to a center point.

It was a classic blockade, and one that had the TVA security and local police scratching their heads when they arrived. For a few hours demonstrators danced, sang drummed and talked to the media. As dawn broke with a light rain, a 14-mile traffic jam snaked down the road.

Immediately after informing demonstrators they could leave the site and avoid arrest, police charged the crowd and began making random arrests. When the dust settled, 54 people had been arrested for trespass, including a legal observer who had express permission to be present, musicians, and photographers, as well as the blockade group. When supporters followed those arrested to the town of Dayton, the entire group was threatened with arrest for "inciting a riot" unless they left town immediately. Four activists were arrested as they approached the jail seeking information. A cop told an activist who asked about her civil rights, 'You left your civil rights at the county line." Welcome to Tennessee.

Most of those arrested were released within 48 hours, on $ 1,000 bail each. Fifteen persons did not post bail and were held eight days until the first preliminary hearing on July 19. After four hours of trying to make a case against the group, the prosecutor offered a plea bargain of $ 25 fine for no contest pleas. 30 people accepted the deal while 24 others pleaded not guilty and they will face trial in December.

All those who participated in the action feel that it was a target well chosen. The plant is not yet licensed or loaded with fuel, and the action a classic non-violent blockade has put Watts Bar on the map at a crucial time.

Contact; Ka titah Earth First!
P. O. Box 281, Chattanooga, TN
37401 U.S.A.

"Well Within Internationally Accepted Levels"

Tritium is a radioactive form of hydrogen. It has both a natural origin as well as a man-made origin. Naturally occuring tritium is regularly formed in the upper atmosphere because of cosmic rays. In that case, the level in underground water is about 0.1 Bq/1.

Atmospheric nuclear tests from 1945 onwards have released large quantities of tritium in the atmosphere . The concentration of tritium in underground water due to this source is found to be between 1 to 5 Bq/1.

Besides tritium is created as an unwanted by-product in heavy water reactors. It is released to air and water during normal reactor operations, and can be detected in the local environment around nuclear facilities at levels above what would otherwise be found.

The present "allowable" level of tritium in drinking water in Canada is 40,000 becquerels (Bq) per litre. An expert committee appointed by the Minister for Environment and

Energy Mr Bud Wild man, has recommended that this level be immediately reduced 400 times to 100 Bq/litre and efforts be made to achieve a target of 20 Bq / litre within five years.

Drinking water contaminated with tritium levels greater than 20 Bq/1 is common in communities downstream from the Chalk River Nuclear Laboratories on the Ottawa River, and downstream from Pickering and Bruce Nuclear Power Stations. The 100 Bq/1 level is often exceeded when accidents involving spills of heavy water occur at these nuclear facilities. In August 1992, a spill at Pickering resulted in tritium levels in Ajax area drinking water peaking at over 1,300 Bq/1.

The Advisory Committee on Environmental Standards (ACES) was given the task of reviewing the drinking water standard for Ontario, This happened because of concerns about a plan to build a new water supply facility in Ajax, a few kilometres downstream of the Pickering Nuclear Generating Station. Many local residents and groups requested a full environmental assessment of this facility because of concerns about water quality and other outstanding issues.

The ACES report has clearly described the double standard that is being applied to radioactive contaminants, compared to other toxic materials. Most contaminants have standards set that are based on a lifetime of exposure, whereas radioactive pollutants have had exposure standards calculated based on one year of exposure. The standards branch of the Ministry of Environment and Energy prepared a proposal for revising the drinking water standard to 7,000 Bq/1, but failed to recognise the double standard. ACES took the 7,000 level and divided by 70 years, the average lifetime, to arrive at the 100 Bq/1 proposal.

ACES has also acknowledged that tritium is more hazardous than is presently accepted, and has proposed that the allowable level in drinking water be reduced to 20 Bq/1 in five years.

Tritium Contamination of Water Near French Military Installation

The military nuclear complex at Marcoule in South of France is authorized to discharge significant quantities of tritium in the river Rhone and in the atmosphere. The yearly quantities are 2,500 billion becquerels in liquid form and 10,000 billion becquerels in gas form.

An independent French nuclear monitoring laboratory CRII-RAD has analysed 22 samples of underground water in the Rhone Valley to determine the level of contamination by tritium due to the discharges of Marcoule. Analysis were also made in a nearby valley Durance. The nuclear research center of Cadarache is located in this valley. In absence of any contamination from nuclear installation, underground water can contain a few becquerels of tritium per litre.

In the Durance's valley the levels of tritium found in underground water are between 1.9 and 2.4 Bq/1 downstream of Cadarache center, compared to 2.2 Bq/1 upstream. The impact of Cadarache discharges are thus not detectable.

However, in the Rhone Valley, the analysis clearly show contamination by discharges from Marcoule. Samples were taken from 17 places from the center up to about 100 km down the river. The contamination is significant near the center where several samples show more than 50 Bq/1 with a maximum of 288 Bq/1. All samples show levels of contamination well above those from the nuclear tests origins, except a deep forage (450 m below ground) which shows less than 1.2 Bq/1. For the samples from farther down, contamination could also come from other industries and hospitals.

Cogema, the state-owned French company that operates Marcoule says that the discharges are much below the levels authorized by the law. The pollution is thus legal!

A lot of questions are still unanswered. Who gives the authorization ? How are the 'acceptable' levels of discharges decided ? How are the risks associated with these discharges evaluated ? How are the doses calculated ? Was specific attention is given to the risks for children?

As Marcoule is a military installation all the information are classified. Therefore all the files related to those questions are not accessible.

Most contaminants have standards set that are based on a lifetime of exposure, whereas radioactive pollutants have had exposure standards calculated based on one year of exposure.

The experts' committee has also acknowledged that tritium is more hazardous than is presently accepted.

What About Us ?

The mainstay of the Indian nuclear programme is the CANDU reactor which produces much larger amounts of tritium than other reactor types. Thus tritium contamination is a severe threat to the health of the people living in the vicinity of Indian nuclear installations. Below we present two tables from official sources which detail the tritium contamination near Raj as than Atomic Power Station at Rawatbhata.

The Central Water Commission has also made measurements of tritium concentration in water samples from different locations around RAPS. Their data is given below.

Tritium Activity of liquid Effluent Released to the Aquatic Environment

Year	Daily Average in billion becquerrels/day	Concentration at Discharge Point bequerrela / litre
1986	42.55	**93**
1987	13.70	38
1988	78.44	**106**
1989	64.38	**91**
1990	64.75	**48**

Source: I.S.Bhat, MA.Iyengar, R.P.Garg, S.Krishnamony and K.C.Pillay "Environmental Impact of PHWR type power stations — Indian Experience" Conference Proceedings on Small and Medium Scale Nuclear Reactors Delhi 1991

Annual Mean Tritium Concentration in RAPS Water Samples

Year **Sampling Locations**	1981	1982	1983	1984	1985	1986	1987	1988	1989
Up to 1 km from RAPS									
Discharge Canal	220	417	160	80	100	50	90	140	170
RAPS Jetty	325	437	141	110	250	60	110	70	130
Heavy Water Plant Nala	—	912	398	740	210	140	180	130	**220**
Reactor Coolant Forebay	110	70	100	60	60	30	40	20	—
From 1 to 5 km from RAPS									
Rana Pratap Sagar Dam Bhabha Nagar	90	148	80	70	50	50	60	30	**40**
Rana Pratap Sagar Dam Vikram Nagar	105	158	100	80	50	50	50	40	**40**
Saddle Dam	115	148	76	50	70	50	40	40	**40**
From 6 to 15 km from RAPS									
Barkheda	BDL	130	BDL	BDL	BDL	**BDL**	BDL	BDL	**BDL**

Source: Central Water Commission Conference Data 1989

BDL: Below Detectable Levels

The first thing one notices on seeing these two tables is the fact that they do not correlate with each other. Thus, for instance, while the amount of tritium released to water in 1987 was three times less than that in 1986 according to DAE sources, the Central Water Commission finds the amount of tritium in the water at different locations to be greater in 1987 ! The credibility of the government is called into question because of such discrepancies in data collected by different government agencies.

Barkheda is upstream of the plant and thus the finding that tritium was below detectable levels there is not a surprise. The data does not tell the detectable level of the instrument used for detection. What is a surprise is the reading of 130 bequerrels/litre at Barkheda in 1982. Since readings from other samples are also higher for that year, there might have been a large accidental and unannounced release of radioactivity Most of the other readings especially in 1 to 5 kilometre region, which incidentally is inhabited by large number of people who use this, water for drinking and other domestic uses, show that levels of tritium have been hovering around 100 becquerrels per litre. This is the limit that the Canadian experts[1] committee has recommended for drinking water in Ontario and five times the limit that they feel needs to be adopted in five years. The claim of Indian nucleocrats that radiological contamination in India is "well within internationally accepted limits" thus refers to situations where the 'international limit' itself is outdated and not an acceptable guardian of public heath.

It is also worth noting that the present contamination is caused by the operation of only two reactors while construction of further two reactors has been proceeding apace at Rawatbhata. When these reactors begin operating, the radioactive contamination of the area would be much larger. If the people of Rawatbhata are not to be further sacrificed on the alter of 'development', there is thus an urgent need for the government to rethink its plans.

Surendra Gadekar

Their True Colours

Antinuclear activists have often been accused of being "anti-national foreign-funded agents". Once in Rawatbhata, I was accosted by a journalist who told me that "RAPS authorities have said that you have received a lot of CIA money for starting an agitation over here." I replied that the only way he could find out for sure would be to visit us in Vedchhi and live with us for some length of time and see if our lifestyle was that of people with a lot of available slush funds. However, my eyes fell on a headline in a newspaper he was carrying which said that Dr. P. K. Iyengar—the then chairman of the Department of Atomic Energy was at the time in Paris negotiating for the supply of two nuclear reactors of French design. I pointed out to this journalist the anomaly of accusing antinukes of being foreign agents while the nuclear establishment was doing its damnedest to procure foreign investment. However, even in my most uncharitable moments I never thought that people in the nuclear establishment were anti-national. Conceited, smug and arrogant, certainly; technology and 'development'deluded megalomaniacs, probably; but anti-national, no.

> *Indians were brainwashed for almost a hundred years about the virtues of self-reliance and Swarajya, hence it would take some time to change their thinking."*
>
> *Dr. M. R. Srinivasan*

A recent report in Times of India of September 20, 1994 by Vidyadhar Date, has shaken my belief. Mr. Date has interviewed Dr. M. R Srinivasan who headed the Department of Atomic Energy in its 'glasnost' phase and who is even now acting as a publicist for nuclear energy and writing extensively in newspapers and popular magazines. I have quoted Dr. Srinivasan's very words (see box) and I will let the reader form her/his own judgement on the nationalist credentials of such globalising developmentists. Since Dr. Srinivasan has been such a strong promoter of the French and German nuclear programmes, we present below extracts from two articles which appeared in the Bulletin of Atomic Scientists and the New Scientist. They present a picture quite contrary to Dr. Srinivasan's eulogy.

The French Mess Nucleaire

The last few years have not been kind to French nuclear projects. The French civilian power industry owes bondholders billions of francs and is increasingly regarded as unreliable. The major producers of nuclear waste in France are the French Atomic Energy Commission's (C.E.A.)and Cogema, one of its many subsidiaries. C.E.A. operates five ostensibly civilian research centres. Its Division of Military Applications (DAM) runs six military research and production centres. The public image of the French nuclear establishment has been badly spoilt following several mishaps. A few years ago, nuclear waste turned up in Paris sewers. A severe drought forced power cutbacks because the rivers into which the reactors discharged hot water fell dangerously low. A severe winter had the same effect, since water froze in the lakes. Thus the much touted nuclear electricity was unavailable in times of greatest need. In March, a technician who was engaged in cleaning up at Cadarache was killed in an explosion (Nature April 7,1994). Cadarache has been built on a well-known fault line that has experienced 40 tremors since December. No one knows if the reactor could survive a major quake (New Scientist May 21, 1994). C.E.A. has also been criticised for spending more than $ 1 billion a year on 'development' when no new plants are in the offing.

Many Accidents Little Information

Although accidents have been legion, the public has been told of few of them—and almost never hears about their impact. A brief reference to a plutonium fire in a meeting of the DAM's Central Committee of Hygiene and Security illustrates the degree of concealment. 'The most serious accident that we have had in metropolitan France was a plutonium fire in building G,"according to a December 1968 meeting of the committee. This accident presumably contaminated at least a portion of a building and possibly spread plutonium outdoors. Despite assiduous searching the authors of the article have not been able to find any other reference to this accident. The only building that they were able to identify as *"G"* is a plutonium handling facility at Bruyeres-le-Chatel, only 37 kilometres from Paris.

> *"In France villagers are taken into confidence before projects are launched and the benefits of the projects are passed on to the local people. Nuclear power projects were being efficiently run by the state."*
>
> *Dr. M. R. Srinivasan*

Mixed-oxide fuel containing both uranium and plutonium is produced at Cadarache. In 1974, the plutonium technology workshop received a batch of fuel rods that had been briefly irradiated in the Phenix breeder reactor. The plutonium workshop was to recover the fissile material from the rods containing plutonium and uranium oxides. The uranium workshop was to process the rods that contained uranium oxide enriched to 27 percent. Unknowingly, two uranium rods were treated at the plutonium workshop, and one rod containing plutonium went to the uranium facility. The switch came to light only at the end of 1976, when the uranium workshop cut apart its share of the rods and experienced "completely abnormal" contamination problems. Each of the Phenix rods had been labelled with a small identification number, but otherwise they were indistinguishable. The CEA kept the incident a secret.

One accident that couldn't be entirely concealed was the release of seven tonnes of uranium hexafluoride at the Comurhex facility at the Pierrelatte uranium enrichment site. A visible cloud of hydrofluoric acid drifted beyond the site's boundaries. The accident, one of many chemical spills at Pierrelatte, occurred July 1, 1977.

Disposal by Dilution

Any report of French expertise in waste disposal should be taken with a grain of salt—no independent body is monitoring waste disposal activities. The clean-up measures that the industry is known to be taking—diluting the waste and minimising the amount of waste—are suspect.

The Air Above

The earth's atmosphere has been considered a prime waste-bin by French nucleocrats. Reprocessing of spent fuel to recover plutonium at the Marcoule production site released many radioactive pollutants such as carbon 14, rare gases, tritium, and iodine. Marcoule Tritium Workshop, which removes tritium from irradiated targets and DAM's Valduc Centre, which assembles the fissile and thermonuclear components of weapons, have each emitted significant quantities of tritium. The Valdue Radiation Protection Service even burned tritiated waste in the open air at a farm on its property from 1968 to 1975. In 1979, when the centre stored solid tritiated wastes, tritium releases from the operations were of the order of 290,000 curies per year. For comparison, the Rajasthan Atomic Power Station released a mere 70,000 curies in 1990.

The Waters Around

The CEA has always taken advantage of rivers for the disposal of liquid waste. Fontenay-aux-Roses released waste through the sewer system into the Seine; Le Bouchet most likely employed the Essonne; and Marcoule, certainly the Rhone. CEA reports state that suspect effluents from Saclay went to a pond that had been created at the time of Louis XIV to collect water for the chateau of Versailles.

In the 1970s, the navy dumped radioactive liquid effluents from submarine reactors into the ocean off the ile d'Ouessant. Presumably, the effluents had been treated with resins on board the submarines. Workers called a special tank ship that did the dumping the "Minirem." Ocean dumping was the CEA's answer to solid as well as liquid waste. In 1960 the commission intended to dump 6,500 containers of radioactive sludge from Marcoule into the Mediterranean just 80 kilometres off shore. After protest, the CEA backed down and dumped only 20 containers for experimental purposes." In 1967 and 1969, however, the CEA got rid of an additional 46,000 containers from Marcoule by participating in two European Atomic Energy Agency dumping excursions in the Atlantic Ocean.

The Ground Below

Injecting liquids into the soil has been a temptation at sites not near substantial bodies of water. Between April 1958 and May 1959, Saclay injected-as an experimental,188 cubic metres of water contaminated with strontium, tritium and yttrium into the ground. The centre continued to experiment with injection in the mid-1960s, but whether it was adopted as a regular practice is not known. Valduc, which like Saclay is not near a river began evaporating its liquid effluents in 1971. How it disposed of its effluents between the late 1950s and 1971 is a mystery.

Disposal by Shrinkage

Prance has no permanent disposal site for highly radioactive or alpha contaminated waste. Much of the waste is currently stored where it was generated.

One way of decreasing the volume of waste is simply to put it into public domain. A CEA document reports, for instance, that several hundred tons of metal, some from Valduc that was slightly contaminated with tritium, and some from Marcoule that emitted 'slight' beta and gamma radiation, were "recycled" outside the nuclear industry in 1987.

Another major method of reducing the volume of waste is by applying heat to it. The CEA has operated incinerators off and on since 1963. It has also melted contaminated metal in a furnace at Saclay and Marcoule.

These methods share two major disadvantages. First, heating or otherwise melting radioactive substances volatalises caesium 137 and other radionuclides, which may then escape. Trapping them necessitates complex system of gas purification that are liable to break down if not scrupulously maintained. Incinerating waste produces secondary wastes that may themselves be difficult to handle. The CEA has not yet learned how to treat the ash from its reprocessing facility UP1 to remove enough of the plutonium to permit its final storage above ground.

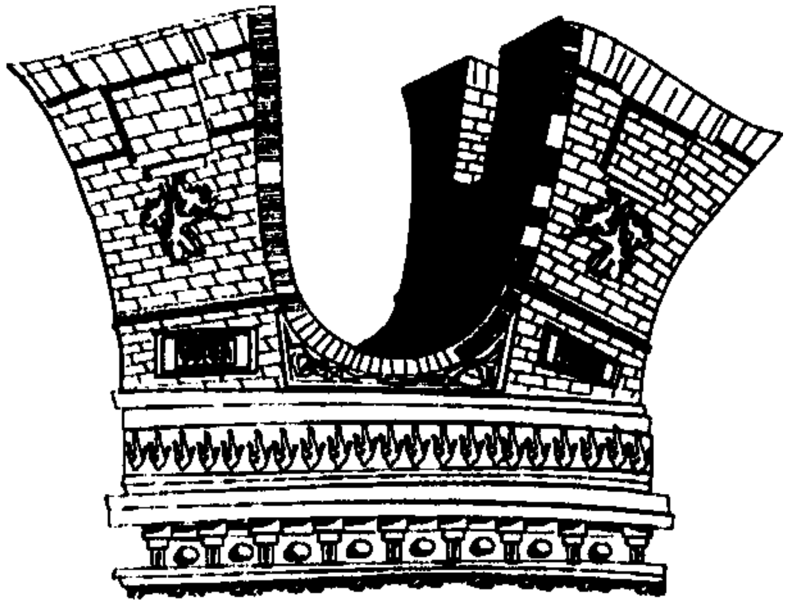
The French have touted vitrification (or glassification) as the perfect means of preparing radioactive waste for storage. Actually, vitrification shares the major problems of heat treatment because fission products are calcined and then melted. Furthermore, the glass blocks produced at Marcoule are suspect. As of 1990, the French did not subject individual glass blocks to quality control, and hadn't sufficiently studied the corrosion-resistance of the glass blocks fabricated at Marcoule. Furthermore, the CEA's current plans for cleaning up Marcoule include the "repackaging of old glass logs" and 'the taking back of contaminated glass"stored underground.

Contaminated Groundwater

In siting nuclear centres, the CEA seems to have been drawn like a dowsing rod to places where water lies close to the surface. It has also favoured sites where the ground above the water is permeable. Documents available to us refer to the groundwater contamination at Pierrelatte, Valduc and Marcoule. But water under other sites, particularly those with underground storage of waste and permeable soil, may also have been contaminated.

At Pierrelatte in 1976, an incident in an installation which converted uranium tetrafluoride to uranium hexafluoride contaminated groundwater with uranium and fluorine. At Valduc, metal contaminated with tritium was stored in an old cistern into which water still flowed. As a result groundwater was contaminated with tritium.

This incident may not have been the only source of contamination at Valduc. Despite an earlier formal complaint, a worker representative complained in 1981 hygiene committee meeting that about 800 containers of tritiated waste were 'still at the mercy of the weather, thus contaminating the groundwater."



L'Are de "Defeat

Taken from: David Macaulay; Great Moments in Architecture

Monument to the French Nuclear Programme

Minutes of a 1975 meeting of the Marcoule hygiene committee refer to the fact that a leaky joint in the pipes in room 48 at the Marcoule Pilot Workshops had slightly contaminated the groundwater. Other accidents that may have contaminated groundwater include a 1970 leak in an old buried pipe that had received radioactive effluents from a metallurgy workshop. The leak seriously contaminated the ground with plutonium and perhaps with other nuclides.

That such incidents have had a lasting impact on groundwater is strongly suggested by a 1990 Cogema document revealing that Cogema had to build a 450-metre waterproof wall underground, to the south of the effluent treatment station, in order to prevent groundwater from flowing south. Behind the wall, Cogema pumps out two to three cubic metres of water per hour.

CEA and Cogema monitor the radioactivity of the water beneath and near their nuclear sites, according to Cogema and CEA reports. However, they don't make the results public. No independent body had examined the groundwater around the sites, although radioactivity released into the air, soil and water is likely to end up in the subterranean water.

The Super Failure of Superphenix

The C.E.A. is hoping that the money guzzling fast breeder, Superphenix can be turned into an asset. This one an only commercial scale fast-breeder reactor in the world has been plagued by a series of disasters ever since it began operations in 1986. The reactor which was completely shut down since 1990 has operated a total of only 174 days in eight years—a record which puts even Indian non-functioning reactors to shame. Its most persistent problem has been leaks in the cooling system. The liquid sodium coolant employed at Superphenix can be explosive when exposed to air.

With the global change in attitude about the value of plutonium, C.E.A. would like to see the Superphenix rise from the ashes as a plutonium burner rather than a breeder. The agency claims the reactor could dispose of 200 kilograms of plutonium a year if it can be made to operate reliably. The government admits that it has abandoned the idea that Superphenix will ever make money.

Calculating Real Costa

Moving towards privatisation, the government no longer guarantees nuclear industry bonds. The nuclear engineering company Framatome is to be privatised. The commission is also looking to other companies to take over other technologies.

An independent study, *'The Costs of Nuclear Power in Western Europe"* by the International Project for Sustainable Energy Paths, points out that the French emphasis on nuclear power has had other negative effects. According to the study, so much money was spent on nuclear power that France neglected to clean up its fossil fuel plants. The result? Its sulphur dioxide emissions are twice as high per kilowatt-hour as neighbouring Germany, which installed scrubbers. The study found that official estimates of operations and maintenance costs had been systematically underestimated. They had been estimated to rise at 1.5 to 2 percent per year while actual increases have been five to six percent. Overall, government nuclear costs have been underestimated by at least 60 percent. Taxpayers usually end up paying the difference. The study also decries the 'fluid boundaries" between civilian nuclear power and French nuclear weapons programmes: the close connection has allowed the government to keep extraordinary silence on aspects of both.

Based on two articles by Mary Byrd Davis and Linda Rothstien in the Bulletin of Atomic Scientists July/August 1994.

GERMan NuclEaR

On the banks of the river Elbe, in the wooded heart of northern Germany, stands a big yellow building. It is 189 metres long, 40 metres wide, 20 metres high and cost £ 32 million to construct. Around it stands a high security fence and a large earth rampart. For the last 11 years it has stood there, cavernous and empty.

The building has been nursed by nuclear companies, blockaded by antinuclear protesters and bitterly disputed by politicians on primetime television. The building, near the village of Gorleben, is an "interim store", meant to house spent fuel from Germany's nuclear power stations for at least the next forty years. It is also the likely destination for blocks of highly radioactive waste produced by the reprocessing of German spent fuel at Cap de la Hague in France and Sellafield in the UK

The interim storage has been licensed to receive up to 1500 tonnes of spent fuel since 1983, but none has yet arrived. The electricity companies are being prevented from opening the store by the local government of Lower Saxony—the state in which Gorleben is situated.

On 19th July 1994, spent fuel from Philippsburg Nuclear Power Plant was loaded into a cast-iron '"Castor" flask ready for shipment to Gorleben. But since then the flask has been sitting on a railway wagon under a blue awning outside the power station while thousands protests and the politicians argue.

The massive (up to six metres long) castor flasks are meant to be the main barrier against leakage of radioactivity into the environment during storage. The nuclear industry hopes that the castor would allow it to store radwaste for forty years. This is the first attempt at dry storage of high level waste for such a long period anywhere in the world and naturally the nuclear industry everywhere is very keen that it succeed.

The whole operation has encountered a number of technical problems while loading the flask at Philippsburg. The castor has to be shut airtight. However, the engineering inspector for the state government reported that one of the flask's two stainless steel lids was more than 10 millimetres wide and could only be made to fit after last minute improvisations. If the flask were to leak after arrival at Gorleben, it would have to be transported in the same leaky state back to Philippsburg since there are no remote-handling facilities for repair at Gorleben.

Demonstrators have built a small village of wooden huts named CASTORNIX near the entrance of the storage site. Streets have been painted, traffic signs struck over and holes have been dug under the streets leading to the storage site. On November 5, all large streets in Liichow-Dannesberg (the region of Lower Saxony where Gorleben is located) were occupied by demonstrators.

The antinuclear movement knows that if the first castor is stored at Gorleben, many would follow. The people of Liichow-Dannesberg are determined to fight against this assault on their lives and the lives of unborn generations of their children. Good luck to them. Are you listening Dr. M. R. Srinivasan?

Based on an article by Rob Edwards in New Scientist 8.10.94 and a news item in the WISE News Communique 422 18th November, 1994.

Florida Nuked Chicken to Iraq

Vindicator Inc. is the only company running a food irradiation facility in the US First it tried its hand at irradiating fruits and vegetables which were meant for distribution within US That did not work since nobody wanted to stock the stuff. Next, it was irradiated chicken. Still, no go. The company has been losing more than $ 100,000 a month for the last nine months.

According to an article in the Associated Press, Vindicator has teamed up with a company called US Harvest Technologies to ship "up to 25,000 tons of cobalt-irradiated chicken to Iraq." Are these nuked birds intended to finish the work started by US marines two years ago?

Safe Food New Winter 1993

Dr. Rosalie Bertell to visit lndla in December

Dr. Rosalie Bertell needs no introduction to antinuclear activists. Winner of the Right Livelihood Award and the much acclaimed author of No *Immediate Danger,* she has been a source of inspiration andlielp to many. She is to visit India in December. It is proposed to hold a one-day workshop for activists at Bombay on Wednesday, December 7,1994.. The venue of the workshop has not yet been decided but friends who want to attend should contact Shri R. Ashokr Kumar, at Bombay Sarvodaya Mandai, Gandhi Book House, Tardeo, Bombay. Telephone: 561-5916.

Besides Bombay, Rosalie also will be visiting Trivandrum (Dec. 8 -11); Bhopal (Dec. 12); Calcutta (Dec. 14 -18) and Delhi (Dec. 19). We have given her proposed itinerary in detail so that activists and in fect anybody interested in the nuclear issue can get in touch with her and take advantage of this opportunity.

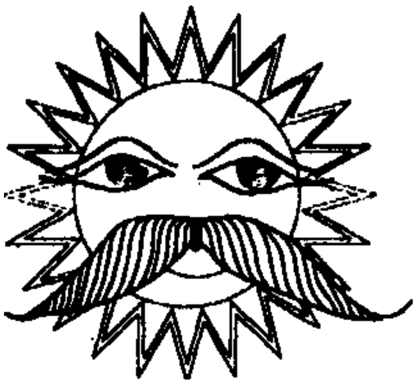
Letter (Box

Protest Against Kalga Nuclear Want

About 2,500 people had gathered in Karwar on 2nd October for our rally to protest against Kaiga nuclear power plant. 80 friends from Goa had also come to show solidarity. Even people form Sholapur area have now begun to seriously think about dangers of nuclear power. But even now, people are not yet confident that they can stop this plant with their own efforts. Once the elections to the state assemblies are over, we shall have to restart our programme to raise people's awareness and undertake 'padayatras'. We intend to have a meeting in Sirsi and formulate a decentralised programme from there.

You must come for this awareness programme. We were eagerly waiting for you at the meeting on 2nd October, but then we realised that plague in Surat would be a great obstacle in your coming. But as we saw in the meeting on 2nd October, there is a lot of enthusiasm amongst the people and if three or four people undertake some sustained work, I believe it would not be difficult to get many to oppose the construction of the Kaiga plant.

Dr Kusuma
Snehakunja, Kasarkod, Honnauar,
Uttara Kannada, Karnataka



The Only Sets Source of Nuclear Energy

Food Irradiation

Food and health are vital concerns. The very survival of people is at stake. Since the irradiation of food articles impinges upon these critical matters it is imperative upon the government to institute a massive information dissemination programme so that the consequences of this technology could become clear to every body and the choice of whether to accept or to reject this technology could be an informed one. Instead, the Government of India had decided to go ahead with its food irradiation programme with not even a hint of public debate. Even the queries of concerned citizens like me have elicited no reply from the concerned authorities. This dictatorial step by the so-called servants of the people must be opposed.

R. Ashok Kumar
Bombay Sarvodaya Mandal

Rs. 30/-per year (6 issues) within India
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 5001- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0631) For cheques and drafts drawn on other banks, please add Rs 101-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti
Vidyalaya
Vedchhi, 394 641 India
Tel: 02625-2074

Please do not send personal cheques or drafts addressed to Surendra Gadekar

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Pubished by S Gadekar for Sampoorna Kranti Vidyalay end printed at. The Parijat Printry, Ahmedabad

PRINTED BOOK

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 8 Number 3 December 1994 / January 1995

The Long Death

Radiation is like oppression
The average daily kind of subliminal toothache
you get almost used to, the stench
of chlorine in water, of smog in the wind

We comprehend the disaster of the moment,
the nursing home fire, the river in flood
pouring over the sandbag levee, the airplane
crash with fragments of burnt bodies
scattered amongst the hunks of twisted metal,
the grenade in the marketplace, the sinking ship.

But how to grasp a thing that does not
kill you today or tomorrow
but slowly firm the inside in twenty years.
How to feel that a corporate or governmental
choice means we bear twisted genes and our
grandchildren will be stillborn if our
children are very lucky.

Slow death cannot be photographed for the six
o'clock news. Its cdl statistical,
the gross national product or the prime
lending rate. Yet if our eyes saw
in the right spectrum, how it would shine,
lurid as magenta neon.

If we could smell radiation like seeping
gas, if we could sense it as heat, if we
could hear it as a low ominous roar
of the earth shifting, then we would not sit
and be poisoned while industry spokesmen
talk of acceptable millirems and .02
cancer per population thousand

We acquiesce at murder so long as it is slow,
murder from asbestos dust, from tobacco,
from lead in water, from sulphur in the air,
and fourteen years later statistics are printed
on the rise in leukaemia among children,
We never see their faces. They never stand,
those poisoned children together in a courtyard
and are gunned down by men in three-piece suits.

The shipyard workers who built nuclear
submarines, the soldiers who were marched
into Nevada desert to be tested by the
H-bomb, the people who work in power plants,

they die quietly yearn after in hospital
ward and not on the evening news.

The soft spring rain floats down and
the air
is perfumed with pine and earth.
Seedlings
drink it in, robins sop it in puddles,
you run in it and feel clean and strong,
the spring rain blowing from the
irradiated
cloud over the power plant.

Radiation is oppression, the daily
average
kind, the kind youre almost used to
and live with as the years abrade you,
high blood pressure, ulcers, cramps,
migraine,
a hacking cough;
you take it inside
and it becomes pain and you say, not
They are killing me,
but I am sick now.

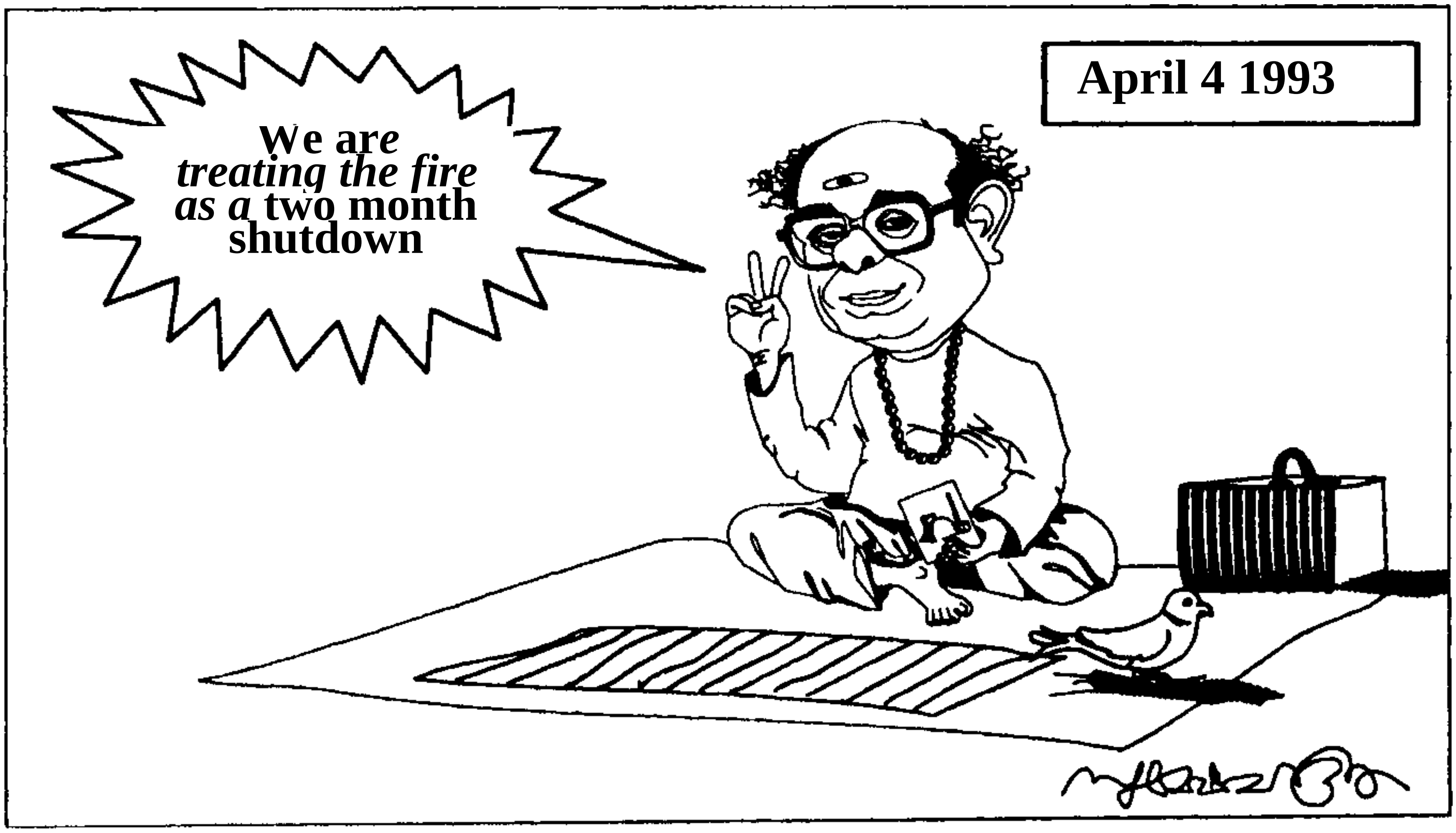
From Circles on the Water
by Marge Piercy

From The Editor's Desk

Scientists as Soothsayers

Supposedly scientists and engineers are people who speak precisely, at least regarding matters of their chosen speciality. If this is true, then one wonders how come nucleocrats are so often wrong in their predictions. One can understand blunders in long term prediction like the one Dr. Bhabha—the father of the Indian nuclear effort—made in 1962 when he said that in 26 years India would have 20,000 MW of nuclear electricity. (We just about reached 1,000 MW) There are various factors which can influence the final outcome and no one even the great Dr. Bhabha could have foreseen everything. But to make such large errors of judgement in short-term forecasts, such as weeks or even days like Dr. Chidambaram about Narora (See Cartoon Below) or the station superintendent of Kakrapar, Mr. Kalaiya, about Kakrapar-1 restart (On July 3rd, he felt that the unit would start by end of July, whereas it actually started end of October,) makes one wonder whether these blunders are actually errors or are they deliberate attempts to mislead the public and the government. Dr. Gopalakrishnan, the chair of the Atomic Energy Regulatory Board, suggests (see page 10) that these "optimistic assessments" may be the age-old approach to get initial financial approvals. But then, is this the scientific way or is it the way of frauds and cheats. The question the public needs to ponder is: Can we entrust our security and well-being to such error prone enthusiasts.

Despite Dr. Chidambaram's prediction Narora-1 takes 21 months to restart


We are *treating the fire as a* two month shutdown
April 4 1993

Paying the Price for Honesty and Courage

Mr. Manoj Mishra's ordeal

No regular reader of Anumukti would be unaware of the havoc created by floodwatera that entered Kakrapar Atomic Power Station on the night of 15th of June, 1994. As has been already described in previous two issues of Anumukti, floods caused large damage to the turbine room where more than two hundred pumps and motors were drowned. The waters also breached the waste containment and some bags containing radioactive waste were carried away and deposited far away from their original disposal site. Had the reactor been in operation at the time, the situation could have resulted in a serious disaster. But although mercifully no great disaster took place the event did highlight the lax attitude towards safety of the nuclear power plant authorities. Some of the glaring irregularities:

No scheduled flood plan exercises had ever been carried out at Kakrapar. The gates which controlled the water level in the reservoir adjacent to the plant had not been opened for years with the result that huge amount of grass had grown around them. Thus, when the water level started rising these gates could not be opened.

I The hydrology of the plant and Its surroundings have yet not been done though two nuclear reactors have already commenced operation.

The drainage points were not situated above the maximum flood level

The much touted "defence in depth" was found in practice to be full of holes. Major pumps which run the secondary cooling system of the reactor like the Boiler Feed Pump, the High Pressure and Low Pressure pumps were located below ground level and were drowned under the flood waters. But under the defence in depth concept, each of these had auxiliary pumps which should have taken over and continued uninterrupted operation. However, these auxiliary pumps were also located below ground level and were also drowned and hence having them made not the slightest addition to the safety of the plant. In fact had the water risen a little more, even the diesel pumps which provide emergency power to control the reactor would have been drowned and the reactor would have been left with no power at all.

The station authorities did not feel It incumbent upon them to inform the Atomic Energy Regulatory Board (AERB) promptly of the situation. This illustrates the contempt in which the board is held by officials of Nuclear Power Corporation. The fact that AERB is unable pull up these officials and take any strong action where these people are personally held responsible and have to pay a price that bites for their lapse, adds to the contempt.

All this shows a criminal negligence on part of designers, operators and regulators of nuclear power in the country. And yet nobody is likely to suffer any adverse consequences at all. Nobody except Shri Manoj Mishra—the man who blew the whistle.

Shri Manoj Mishra is a plant operator and has been active in the employees'union. He is the secretary of the INTUC lead union. When the plant was flooded on the 15th of June, the authorities were inclined to keep quiet about the whole incident. Even the Atomic Energy Regulatory Board was not informed by the plant authorities. However, Mishra talked to newspaper reporters and apprised them of the possible serious consequences. It was only after the news was published in Gujarat Samachar on the 23rd of June, that people outside and even the nuclear establishment in Bombay, took cognisance of the event. The station superintendent made a dash to Surat and issued a statement along with the district collector of Surat assuring all and sundry that all was well under control.

Mishra was immediately suspended from work for the crime of talking to the press and his suspension continues even today, five months after the event. While all those who displayed singular dereliction of duty continue merrily along, the one man who put the interest of the country above his own selfish interests has been made to suffer as an example to others that in the nuclear establishment the only leaks' that matter are leaks of authentic information.

The Going Rate

On August 6th, 1994, Shri Narayan Desai had written a letter to all the legislators of Gujarat assembly asking them to form an all party committee and investigate the damage caused by floods to the Kakrapar Atomic Power Station. Busy as all these worthies are with the welfare of the people only five of them found time to reply to his letter. However, the MLA from Kadi in Mehsana district of North Gujarat, Shri Nitin Kumar Ratilal Patel sent our letter to Kakrapar authorities for their comments. Five months later, on January 16th, 1995, we received a copy of the reply from the station superintendent of Kakrapar Atomic Power Project. We have reproduced parts of this letter elsewhere in this issue. While ending, the letter states, 'The welfare of the public is fully taken care of. Kakrapar Atomic Power Station has taken innumerable measures for the welfare of the people around the area as per Annexure." We are reproducing the annexure in full for two reasons. One, it is fine example of what nucleocrats believe to be 'development', And secondly, we do not want people around other nuclear installations to be unaware of the going rate for disease, deformity and death.

Nuclear Power Corporation
Kakrapar Atomic Power Project

Details of assistance rendered by Nuclear Power Corporation of India Ltd. to surrounding villages and areas of the Kakrapar Atomic Power Project.

L Land compensation

a) Original disbursement as per the award of Land Acquisition Officer Rs. 73,58,803.66

b) Additional compensation disbursed as per the Court's verdict is Rs. 99,54,049.50

c) Further additional compensation likely to be awarded as per compromise formula being arrived at is Rs. 2,50,00,000 /-

2 In addition to land compensation, 85 families were compensated for cost of houses.

3 Additional 40 families occupying houses in government land were also compensated as special case for houses.

4 Additionally building materials of houses were allowed to be taken away by the house owners and free transportation for shifting materials provided.

5 Rs. 12,57,000 /- deposited with State Government for rehabilitation of displaced families.

6 116 persons of land affected families directly recruited by KAPP

7 Land affected persons in large numbers were also employed in establishments of contractors.

8 Training imparted to land affected persons for getting selected to ministerial / clerical posts in KAPP.

9 Training and nourishment programme conducted for land affected persons to facilitate induction by Central Industrial Security Force.

10 Students belonging to land affected person's families and others in surrounding villages imparted English familiarisation classes.

11 Candidates belonging to land affected person's families are given preference for recruitment Only if suitable candidates from land affected families are not available, other means of recruitment Like through employment exchanges is resorted to.

12 Total number of locals directly recruited by KAPP are 657 and the number of land affected persons are 116.

13 Land affected persons are given preference in allotment of shops etc. in the residential township.

14 Efforts are on to help the villagers in forming Worker's Co-operative Society to undertake petty works and contracts connected with the Project.

15 Medical camps have been organised every year in association with voluntary organisations of the township. Large number of villagers availed the facility including the facility of eye-operation conducted during the medical camp. Free transportation and medicines are provided to the patients and also follow up facilities given.

16 Continuous measures are taken for creating awareness of the general public with regard to the project. As part of this, regular visits of villagers, children from schools, colleges, and other educational institutions are organised to the plant site. The visitors are provided with free transport and other facilities.

17 Rs. 2,68,000 /- was sanctioned by NPCIL to the Vyara Municipality for construction of roads in Vyara.

18 An amount of Rs. 2000/- is given to three village schools nearby every year towards the cost of study tours for the benefit of the students. The village school in Unchamala has been given infrastructure1 facilities, educational aids etc. and action is also on hand for giving financial assistance for construction of school extension building.

19 NPCIL has sanctioned financial assistance to the tune of Rs. 5,00,000 /- for the Mandvi Education Society.

20. Approval has already been obtained for financial assistance to the tune of Rs. 20,00,000/- for improving the existing roads between Moticher, Tarsada, Nanicher and Raj wad villages. Approval has also been obtained for extending financial assistance for construction of roads from two village hamlets located near the plant site boundary and linking them to the Vyara Mandvi road.

21 A Cricket pitch has been laid by NPCIL at Vyara for the promotion of the sport of Cricket.

22 Action is in hand for the supply of saplings to nearby village schools.

23 For public relations, public awareness and assistance to villages, over and above the facilities given above, an amount of Rs, 60,000/- is regularly spent every year.

Raising Public Awareness—Nuclear Style

As mentioned in the previous article, Shri Narayan Desai had written a letter in Gujarati to all the members of the Gujarat Legislative Assembly. This letter had clearly stated what had happened on June 15th and had asked the legislators for:

Constituting an all-party enquiry committee which would investigate and report to the public in a reasonable time. The committee should look into the following:

What were the reasons for the delay of at least 12 hours between the flooding of the turbine room and the declaration of site emergency?

What were the reasons for declaring the site emergency?

Why were the people living In the vicinity (within 30 kms) of the plant, not informed of the situation?

What was the extent of the damage to the waste management area? How many waste filled drums are kept at different locations within the KAPS premises? What are the contents of these drums?

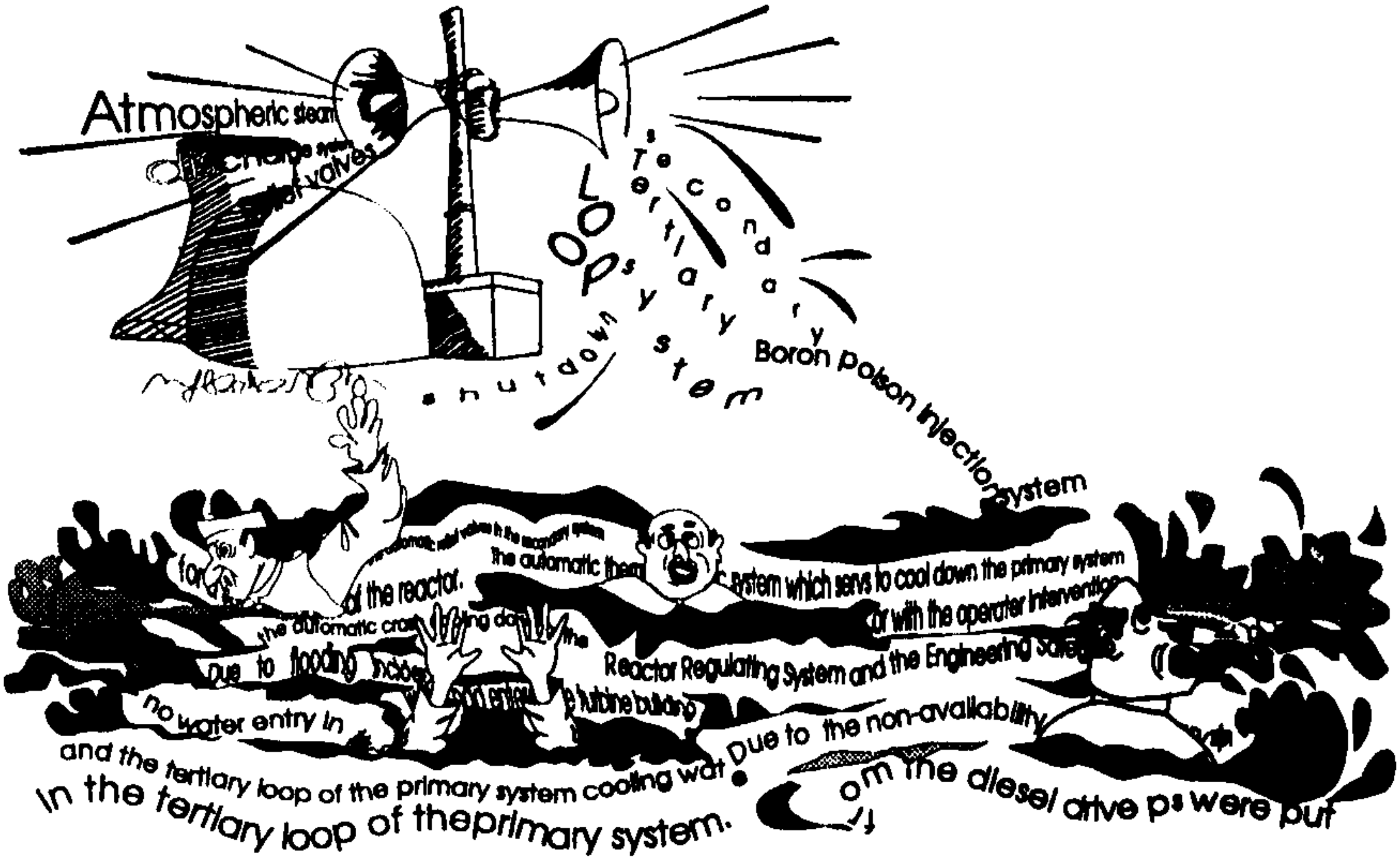
What amount and kinds of radionuclides were released to the environment? What are their long term Implications for public health?

B How do the authorities propose to evacuate the public in case of emergency during monsoons when the condition of the roads makes the task Impossible?

Most members of the Gujarat assembly were too busy to bother about the letter in any way leave alone constitute a committee. This was especially true of our local MLAs whose constituencies would be directly and immediately affected in case of any accident at Kakrapar. Mr. Nitin Kumar Patel, the member for Kadi in Mehaana district of North Gujarat, sent the letter to the Kakrapar authorities. Below we are reproducing some operative portions from the reply.

"Before we furnish our specific comments on the letter of Shri Narayanbhai Desai, we would like to reiterate that Kakrapar Atomic Power Station is a nationally important venture of the Government of India employing a frontier technology. The Nuclear Power Corporation of India Limited who is entrusted with the responsibility of designing, constructing, commissioning and operating of the Kakrapar Atomic Power Station has four decades of technical expertise in the nuclear field. This power station has all the required safety provisions to foreclose eventuality of any accidents. The Station is designed and operated in accordance with the codes and guides of the International Atomic Energy Agency and the Atomic Energy Regulatory Board. The guidelines set by the International Committee on Radiation Protection are also followed scrupulously. In addition, NPC in association with the Government of Gujarat has drawn out detailed emergency preparedness programme for handling any plant/site emergency. There need be, therefore, no apprehension whatsoever about the safety and security of the Kakrapar Atomic Power Station."

"With reference to the letter of Shri Narayanbhai Desai, we herebelow give our comments:


Atmospheric steam
discharge system
relief valves
Secondary
Tertiary
Loop system
shutdown
system
Boron poison injection system
automatic relief valves in the secondary system
The automatic therm
system which servs to cool down the primary system
or with the operater intervention
of the reactor.
the automatic crash cooling down
the
Due to flooding incident
Reactor Regulating System and the Engineering Safeguards
turbine building
no water entry in
Due to the non-availability
and the tertiary loop of the primary system cooling wat
from the diesel drive ps were put
in the tertiary loop of theprimary system.

The Real Flood

The flood water entered the Turbine Building and submerged the equipment on the .secondary system and the tertiary loop of the Reactor systems. The condensate pumps, the Boiler feed pumps etc. serve the secondary loop of the main Reactor systems. The active high pressure and low pressure process water serve the tertiary loop of the main systems. Due to the non-availability of the above systems there are different other systems like the shutdown cooling in the Reactor Building,' atmospheric steam discharge system in the secondary systems, the automatic relief valves in the secondary system, the automatic crash cooling down of the reactor, the automatic thermosyphonic system which serve to cool down the primary system without or with operator intervention. If the reactor is in operation stage then the reactor protection system, reactor regulating system and the engineering safeguard features are designed for a safe shutdown of the reactor. Due to the flooding incident, water had entered the turbine building and there was no water entry in the reactor building which remained in the normal condition. Due to the non-availability of the secondary systems and the tertiary loop of the primary system cooling water from the diesel driven pumps were put into service in the tertiary loop of the primary system i.e. the cooling water portion of the shutdown heat exchangers and the same thing could have been done if the reactor had been in operation. This is the provision of the systems and the design provision had been utilised. Due to the flooding incident the secondary systems in the form boiler feed pump, condensate pumps became non-available. If the reactor was in operation the heat removal of the secondary systems would have been done by the atmospheric steam discharge valves and the relief valves. These are given in the design provision so it is being emphasised that the flooding incident has not jeopardised safety of Kakrapar Atomic Power Station and the systems provided in the design had been utilised to meet the situation."

The letter goes in the same vein for five full pages. I will not test the patience of *Anumukti* readers by reproducing it in full. This is just an example of the kind of junk served by these worthies in answer to honest queries regarding their performance. Can any one, even they themselves in their sober moments, make sense of what they have written? All they want to really say is that they managed to cool the reactor by using diesel pumps which luckily did work in time and in case the reactor had been functioning the same process might have sufficed. Obscured in all this verbose jargon is:

> *the fact that despite four decades of experience in the field they had no clue regarding*

ways to prevent the calamity from taking place such as ensuring proper drainage.

It was pure luck that the diesel pumps were also not drowned in the floods. The authorities had not taken any concrete steps to prevent the water rising in the turbine room except to curse the irrigation authorities for their inefficiency and incompetence in being unable to open the gates of the reservoir. Had the water level risen a little more, the diesel pumps would have also drowned and even this fig-leaf of an excuse would have disappeared. The fact is that drowning of the reactor in floods was an "inconceivable" accident to them and the people of the state and the country could have paid a crushing heavy price for lack of foresight and imagination on part of these guardians of public trust.

Regarding the detailed questions on the radioactive waste the letter has this to say:

Solid wastes generated from the different areas are stored in drums and then the drums are kept in earth trenches. This is as per the design, the same thing being done for very low active **wastes.** The high active wastes are stored in RCC trenches and high integrity tiled holes. Due to excessive rains, the earthen trenches became full with water. Only one drum lid opened and two bags came to the surface. The bags, which contain low active cotton wastes, are already contained in plastic containers so the spread of radioactivity was not there. The **floating** bags of 2 Nos. were already within the fence only so the spread of contamination is out of question Any spread of radioactivity in the area will be located by the bore holes (32 Nos.) which are located around the solid waste burial ground. All the borehole samples are analysed and found to be below detectable level.

Nice to know that we have the Mate of the art technology: fences and plastic bags to nave us.

But what takes the cake and leaves me speechless is the following:

'There is no effort by the Station authorities to keep anything in the dark. Shri A. K. Asrani, Director (DR&I), AERB and his representatives. Director (Projects), the Chairman of Safety Analysis Review Committee for Operating Plants (SARCOP) and Advisory Committee for Projects Safety Review (ACPSR) have visited the site and the matter has been very much open to the public."

Surendra Gadekar

After a long period of blissful dormancy,
nuclear plants have suddenly started going on-line

Nuclear Should Get Its Act Together

Dr. A. Gopalakrishnan, Chairman,
Atomic Energy Regulatory Board

There was a time that I would present arguments from nucleocrats in all their gory and boring detail just for the pleasure of chopping them to bits. These childhood pleasures are hopefully a thing of the past and now-a-days I am loath to give them any space in Anumukti at all. I believe that the nuclear establishment, however strapped for cash it might be, has no dearth of money for advertising its views and no lack of 'friends' in the media. But sometimes one does come across an article, which, considering its source, is so Anumuktish, that one has to make an exception. However, in the present case, it must be stated that the article has been edited in the interest of brevity and provided with heading and sub-titles. Needless to add that Nuclear can never get its act together.—Editor

Current Status

The two 220 MWe unite each at Narora and Kakrapar are on line, and this 880 MWe will be poised in the near future for operation at its full rating.

In the case of Rajasthan Units-1 & 2, AERB is still awaiting the final decision of the Nuclear Power Corporation. From what we know, it would appear that RAPS-2 is ready for en-masse coolant channel replacement and would be under shutdown for at least three and half years from the time the retubing effort is initiated. Therefore, the earlier that NPC embarks on this task, the better it would be, since a great deal of careful planning, review and preparation will be needed in this first-of-a-kind effort. As for RAPS unit-1, it is doubtful whether we can authorise its re-start without a complete in-service inspection of all its pressure tubes. Whether or not NPC intends to continue the operation of RAPS unit-1 under the present circumstances is also a matter in which we are awaiting NPC's decision.

Overall, what DAE needs to do in Rajasthan is to cut its losses as much as possible and expedite the rehabilitation of unit-2. It would help if NPC is given a totally free hand in this endeavour, without imposing unnecessary policy constraints on how and from where they should manage to get the required assista nee to meet this objective. The primary concern should be to minimise the overall loss of time and money.

> *'What DAE needs to do in Rajasthan is to cut its losses as much as possible."*

Safety Should Not Be Ignored

In the case of Tarapur 1 & 2. we appear to have come out of the uncertainties in fuel availability. Over the last two and half decades, it is creditable that the Tarapur units have contributed a notable percentage of the nuclear electricity supplied in India. However, we have to be conscious that these are the oldest of our power reactors, having seen almost 25 years of operation since their commissioning. No boiling water reactor of the same vintage is currently being operated anywhere else in the world. Wherever such older units elsewhere are stated to have been decommissioned because of "economic reasons", a closer look reveals a different picture. The only alternative to decommissioning these reactors would have been to make all the mandatory and costly additions and improvements to their safety related sub-systems. Considering the fact that these alterations were decided after extensive consultations between the General Electric Co., who is also the designer of the Tarapur Units, and the US utilities and their regulatory agency which manage a total of over 35 BWR units, it is not prudent for us to ignore them totally. The situation is further complicated by the recently observed core-shroud cracks in 11 out of 19 BWRs so far examined, which indicate an urgent need for core-shroud inspection also at Tarapur. Added to this, the extensive leaks in the secondary steam generator tubes in both units of Tarapur have resulted in the steam generator shells now serving as part of the primary system boundary — a situation not envisaged during design.

Overall, therefore, fuel being available for TAPS is only the alleviation of part of the concern. We need to settle also the uncomfortable questions related to safety, including the ones which I mentioned. This can be done if we give the right priority and emphasis to these issues. AERB will be soon seeking for an action plan from NPC in this regard and we hope the schedule for inspections and corrective steps to be evolved will match the relative urgency of the issues, consistent with their safety significance.

Unrealistic Forecasts

The Kaiga project is partially held up due to the unfortunate delamination of its inner containment dome. The actual work on the dismantling and removal of the failed dome, NPC's own investigation of the failure and the re-engineering of the dome are all lagging behind their original schedules. We need to avoid giving unrealistic initial schedules and ending up in unusually large slippage subsequently. This was done in the case of Narora rehabilitation work and the same practice occurs even in the delivery of documentation and data NPC has been promising to AERB and its committees. As it stands, the AERB Investigation Committee on Kaiga Dome Failure is also unable to complete its work due to non-availability of certain material test data and crucial reports from NPC. NPC management must expedite these inputs so that NPC can proceed on with finalising the re-engineering of the dome. Unfortunately, the delay in the finalising the Kaiga dome will affect also the time schedule for Kaiga-2 and RAPS 3 & 4, where also identical inner containment structures are to come up. In passing, let me state that the inner containment dome failure at Kaiga makes it imperative that similar domes planned for the 500 MWe project will have to be subjected to a thorough scrutiny by a competent independent agency before they are approved for construction.

> *We need to avoid giving unrealistic initial schedules and ending up in unusually large slippage subsequently. This was done in the case of Narora rehabilitation work and the same practice occurs even in the delivery of documentation and data NPC has been promising to AERB and its committees.*

No Money

Today, the most serious concern that troubles the NPC is the lack of financial support. As I understand, neither NPC is able to raise much funds from the public nor are they getting adequate financial sources from the government. With the impending long shutdowns of the RAPS-1 &2 units and the potential delay in commissioning of the Kaiga units - 1 and 2, the income to the Corporation will decline, even though Narora-1 and Kakrapar-2 coming on-line will partially offset these losses. There is also the unavoidable expenditure of en-masse retubing of RAPS-2 as well as the cost of inspections and retrofits which may be necessary at TAPS. Down the road, NPC will have to face similar en-masse pressure tube replacements in Madras and Narora units in the not too distant future. Added to these is the question of finances required for the Kudamkulam project and the two 500 MWe units to be constructed at Tarapur. In the light of all this, it is obvious, that unless the viewpoints of the Planning Commission and Finance Ministry change considerably in their favour, the Nuclear Power Corporation will find it hard to comfortably survive through in the near future and come out as a viable business enterprise in the long run.

I am not aware of the discussions which have taken place between the DAE and the other Government agencies in this regard. However, from all available indications, it would appear that the Government and especially the Planning Commission, are not convinced enough that increased budgetary allocations for nuclear power in the current setting are bound to bring tangible returns. Performance of our stations and the high cost of nuclear power generation also appear to be under serious questioning.

In short, nuclear power is at crossroads and it is necessary that the DAE and the NPC urgently formulate a strategy and action plan to enhance governmental and public confidence in nuclear power. This will require an impartial introspection of the current situation and an openness to listen to diverse opinions, including constructive and not-so-constructive criticism both from inside and especially, from outside the DAE family, To my knowledge, I am not aware of such serious dialogue on the subject of nuclear power, involving also the power sector experts, administrators and planners in the country.

Steps Needed For a Resurgence in Public Confidence?

NPC could set a reasonably high target on a two-year capacity factor to be demonstrated in the 880 MW comprising the Kakrapar and Narora units. They could plan and estimate the realistically highest targets feasible in this regard, commit the same to the government beforehand, and deliver what is promised. This would indeed serve as a demonstration of an improved managerial performance on part of

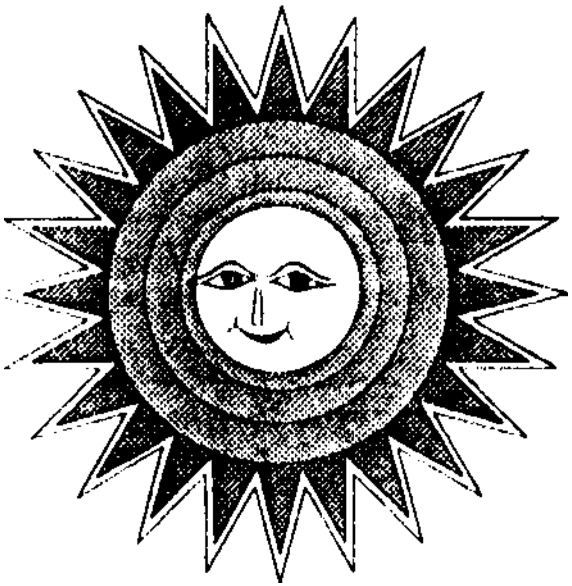
NPC and the Department of Atomic Energy (DAE).

The Madras Atomic Power Station is a site where, in my view, NPC should speed up its efforts to safely increase the operating power level. After a long delay, only couple of weeks ago, AERB has received a proposal from NPC on this matter. There had been some differences of technical opinion within the DAE family on the acceptability of the NPC proposal and it may be necessary that a larger group, involving non-DAE experts, will have to evaluate and settle the issues. I cannot see why MAPS power level cannot be raised within the next six months, and a high capacity utilisation factor maintained thereafter, if such an evaluation identifies no problems.

Constraints

NPC and DAE should start doing realistic project planning and present their plans and defend them even if the schedules are not so attractive. What is happening today is the presentation of a highly optimistic plan at the outset, known to contain unattainable milestones, followed by subsequent presentation of excuses for lapses. This may be the age-old approach to get initial financial approvals, but it leaves certainly a wrong impression of our ability to plan. Furthermore, this practice motivates the internal staff to have no commitment to such a plan since they know that it has been framed without much seriousness.

A crucial necessity for the success of NPC is the availability of adequate technological assistance in a timely manner. Unfortunately, NPC is not self-sufficient in all the required engineering and technological areas, since the intention has been NPC should be provided prompt assistance by institutions like BARC, IGCAR etc. However, today the interaction between the R & D institutions of DAE and the NPC leaves a lot to be desired. I feel NPC should be given freedom to seek and obtain assistance from other sources both inside and outside the country. We cannot expect a power corporation to function efficiently and grow in today's competitive world, if their destiny is solely and closely controlled by the R&D establishment who, in turn, are not able to deliver usable end-results on schedule. Since, in the overall interest, the highest priority of all DAE technological groups should be to provide the necessary support to the nuclear power sector, NPC becomes the focal point for utilising their services. Thus, it is only logical that the performance of these auxiliary institutions should be judged by how well they provide useful and timely assistance to NPC. It is time that the role of various DAE institutions in supporting the Nuclear Power Corporation is subjected to an urgent down to earth review.



Sum: The Only Safe Source of Nuclear Energy

Good Money After Bad?

Extensive studies on viable scenarios for environmentally acceptable electricity generation have been carried out by some institutions in the country. Given the high ash content of Indian coal and the projected resource position for various fuels, almost all these studies have come to the imperative conclusion that nuclear power has to become a strong component of the total electricity production in India by the early part of the next century. Having created extensive and expensive infrastructure in India for supporting nuclear power, neither the public nor the government can afford to let it whither away, due to our inability to manage the interfaces appropriately. I hope the NPC and the DAE will take the present decline in government and public confidence in nuclear power as a forewarning, and initiate corrective steps. Otherwise, it is not unlikely that alternate organisations and control structures may come up in due coarse to get things done which we may fail to do.

(Invited talk: "Nuclear Power: Statue and Prospects" delivered on 9.1.'96 at BARC, Bombay)

Editor's Note:

Incurable Optimists

It would be indeed funny if it were not so sad, that researchers in prestigious institutions who conduct studies of future energy scenarios have such a blinkered (Coal, hydro, nuclear) vision. How come they cannot make out after nearly forty years experience world-wide and more than twenty-five years in India, that nuclear does not deliver the goods, only the bads, To make studies without taking into account long years of actual field performance shows a stuck-in-the-rut mentality. The performance of old nuclear plants in India was no great shakes to begin with, but the performance of new nuclear plants in India is much worse than that of old ones in the corresponding periods of their lives. What is urgently needed is letting in some Sun.

The Golden Goose Stops Laying

Tarapar Reactors Stalled for Want of Funds

The much awaited (by masochists—editor) execution of two additional upgraded nuclear power projects of 500 MW each, at Tarapur, has virtually been stalled for the past two years, for lack of central funds.

Sophisticated equipment, including calandrias, reactor headers, pressurised and primary heat transport pumps worth crores of rupees have been laying idle at the project site, with the Nuclear Power Corporation (NPC) spending scarce funds just to preserve them.

Officials of the corporation say that the infrastructure involving an expenditure of Rs 25 crore had already been developed at the site. The proposed two reactors will be Pressurised Heavy Water Reactors of 500 MW each. They were supposed to be first in a series of large sized plants.

An Example of Nuclear Foresight

"Sophisticated equipment, including calandrias, reactor headers, pressurised and primary heat transport pumps worth crores of rupees have been laying idle at the prefect site."

It is purely coincidental that when large orders are made, private corporations do not forget to show their appreciation of the trust placed in their abilities to serve the nation.—Editor

The Central Government had accorded financial sanction for the project in January 1991 and the authorisation for construction was later approved by the Atomic Energy Regulatory Board (AERB) on September 1, 1993. The AERB had already given safety clearance of the site in December 1989.

Explaining the situation, the Executive Director (Operations) of NPC, Y S R Prasad, said that the main obstacle to the execution of the project was funding. He said there were numerous difficulties, the main being resource crunch, since funds have to be cleared by the Cabinet Committee on Economic Affaire of the Central government.

Secondly , the NPC was facing massive problems in obtaining parts and the necessary technology. 'There are restrictions on procurement of equipment. Technology is not accessible to us and work at the site has been hampered for want of funds, new technology and spare parts," he elaborated.

Prasad said that while India could fabricate all the essential equipment indigenously, there were certain restriction in the global market, as a result of which the project had been delayed. He however assured that though work on the nuclear power projects may take some time, work will never be stopped indefinitely.

The proposed two unit PHWR station is located on the western sea coast, adjacent to the existing 2 x 160 MWe Boiling Water Reactor BWR of TAPS, which is celebrating it silver jubilee this year. The proposed PHWR station is based on indigenous technology which has been proven with the successful implementation of the Kalpakkam Atomic Power Station at Madras, Narora Atomic Power Station in Uttar Pradesh and Kakrapar Atomic Power Station in Gujarat. Its operation will be supported by supply of heavy water from the country's heavy water plants and fuel from the nuclear fuel complex, both under the Department of Atomic Energy.

In present ideology of 'economic liberalisation', Prasad was quick to assert that private participation should not be allowed for the construction of the two additional units.

Financial Express
October 5,1994

Is he a Fool? Or Does He Think You To Be One?

"Mr A.N.Prasad, Director of the Bhabha Atomic Research Centre, said in an interview to UNI that escalating prices of components and the long gestation periods had grossly affected the future of nuclear power in the country though returns were much higher than in thermal power projects. He said the programme had to solely depend on internal generation by the Nuclear Power Corporation and Government funding as no institution, international or national, was willing to finance nuclear power projects."

The Hindu 6 September, 1994

If the returns are so high, then why are national institutions and the markets so reluctant to finance nuclear power projects?

When it comes to Intimidating whistleblowers

The English Are No Better

Trevor Brown spent more than a dozen years warning as many people as he could that safety measures at the Atomic Weapons Research Establishment at Aldermaston were inadequate. His battle cost him his job.

Now, 13 years after he was forced to retire seven years early, he has been vindicated. A report following a comprehensive review by the Health and Safety Executive has said that, had it not been for its immunity from prosecution, the Ministry of Defence could have faced criminal charges over safety at Aldermaston.

Mr Brown was sent to Aldermaston in 1961 to manage a civilian plutonium fast reactor fuel project. It took very little time for him to see that there was inadequate training for line management in safety. The measuring of radiological materials in air was inadequate and there was not access to independent experts to discuss safety measures.

'The management said it was a top secret site and they did not want independent experts," Mr Brown said. "I had to accept the situation." The authorities in fact claimed that safety standards at Aldermaston were so high that they were thinking of making economies by reducing the number of safety staff.

However in 1977 Mr Brown won an agreement from the management that there should be some personal air sampler trials to see how much plutonium was floating around. Until then, measurements had been taken 8 feet above ground in the workplace.

For a week Ken Cummins, a chargehand, wore a sampler around his neck. In that week he breathed in three quarters of a year's dose of plutonium. Mr. Cummins died two years later from bowel and liver cancer. His family believes that Aldermaston was to blame for his death.

Whistle-blowers'

When they hear the whistle blow,
security will know,
that it's time for them all to listen in
—to monitor your phone,
redecorate your home;
yes, it's time for them all to listen in.

When you have got a complaint,
and the boss man says it ain't,
then its time for them all to listen in
—park their van down the block,
all your visitors to clock;
yes, it's time for them all to listen in.

The results of the sampling caused a sensation and Mr Brown was now allowed to speak to an outside expert at the Nuclear Protection Board at Harwell. There he was shown the International Committee for Radiological Protection regulations which stated that it was not enough to sample just one point of a room. Sampling must also be done in the breathing zone of the worker. Neither Mr. Brown nor, as far as he knew, other workers at Aldermaston had seen these regulations before.

In 1978 all plants at Aldermaston were closed down and Sir Edward Pochin conducted an inquiry into radiological safety. He found significant worker contamination and that air samplers in the chimney stack were upside down.

Yet still not much happened, and in 1980 when Mr. Brown was asked to appear on a television programme, he sought the Ministry of Defence's permission. He was told that to do so would be in contempt of court, a reason neither he nor Berkshire council's solicitor understood.

A further request for permission received no response, so he appeared on the programme. '1 made a very mild comment that perhaps excessive secrecy had interfered with safety," he said. "All hell broke loose."

He was severely reprimanded and in 1981 was forced to retire. Today, aged 71, he wonders why it took so long for this latest review There was so much secrecy, an unnecessary amount," he said. "Whether there was a real danger, we do not know. But that is in itself a danger.

Victoria Macdonald

The Worst Nuclear Practice Ever

Russian scientists have disclosed that for more than three decades the Soviet Union secretly pumped billions of gallons of atomic waste directly into the earth. They say the practice continues in Russia today.

The Russians told a small group of Western experts that Moscow had injected about half of all the nuclear waste the Soviets produced into the ground at three widely dispersed sites, all thoroughly saturated. The three sites are Dimitrovgrad near the Volga River, Tomsk near the Ob River and Krasnoyarsk on the Yenisei River. The Volga flows into the Caspian Sea while the Ob and Yenisei flow into the Arctic Ocean.

The amount of radioactivity injected is more than three billion Curies. For comparison, the Chernobyl accident released about 50 million curies of mostly short-lived radionuclides. The accident at Three Mile Island released about 50 curies. The Russian discharges are mostly long lived radionuclides like caesium-137 and strontium-90 which have half-lives of nearly 30 years which means that the threat from these discharges would remain potent for more than a few hundred years.

Russian scientists claim the practice is safe because the wastes have been injected under layers of shale and clay which in theory cut them off from the earth's surface. But already, the wastes at one site have leaked beyond the expected range and "spread a great distance." The Russians have not elaborated on what is meant by great distance—metres, kilometres or has it already reached the surface? The disclosure has set off a debate among experts over the likely consequences of these injections. It would be centuries before we know whether the injections are actually harmless. A catastrophe could occur much sooner.

Upon learning of the injections, Dr Henry W Kendall, a Nobel laureate in physics at the Massachusetts Institute of Technology said that "Far and away this is the largest and most careless nuclear practice that the human race has ever suffered."

TVA Throws in the Towel

Work Halted on Last Reactors Under Construction in the US

On 12 December the Tennessee Valley Authority, one of the largest American power producers, said it would halt work on the last three nuclear power plants under construction in the United States. Two of the unfinished units are at the Bellefonte Nuclear Plant near Hollywood, Alabama. The third, Watts Bar Unit 2, was being built near Spring City, Tennessee.

According to *International Herald Tribune*, the decision "is the symbolic death notice for the current generation of reactors in the US.

TVA once had the most ambitious nuclear programme in the country, with 17 reactors on order. Only five units were actually built and only three of those are still operating. The reasons for this failure are the same which dog nuclear power all over the world: High costs. Besides there was the uncertainty regarding whether the plants once constructed would actually be brought on line.

TVA has already spent US $ 6.3 billion on the units (they were 67%—88% complete), and the authorities estimated that another $ 8.8 billion would be needed to finish them. This was too much even for the already debt ridden TVA. 44% of TVA's debt is due to its nuclear programme.

The decision to halt further construction is a major shift in policy for TVA. No new nuclear plant has been ordered in the US since 1978. Many utilities had abandoned the nuclear dream long ago. But TVA, which is owned by the federal government, and protected from some of the competitive pressures, had obdurately continued to press ahead on the nuclear path. A government spokesman said, TVA had to recognise that policies conceived decades ago are no longer viable."

US is led with a substantial but ageing base of nuclear reactors—109 reactors producing 21% of the country's electricity. Although the end of the first generation of nuclear reactors is welcome news, it needs to be kept in mind that nuclear industry is already seeking federal certification for the next generation.

WISE News Communique 424

Public Protest Force Closure off Canadian Nuclear Plant

Widespread public concern about health has forced Canadian authorities not to renew the license of the Pickering nuclear power station where an accident took place on December 10, 1994. The accident was caused by the bursting of a copper pipe and resulted in a spill of 130 tons of radioactive water onto the floor of the reactor containment room.

Around 1.5 million live within 30 kilometres radius of the Pickering Station. They are concerned about their health following the release of the radioactive water from the ageing nuclear power plant. It is at their urging the the Atomic Energy Control Board (AECB), a federal government licensing and regulatory agency has decided not to renew the license of the nuclear station pending detailed investigations.

According to Nuclear Awareness Group, once the water started to spill, a turbine went out of control and had to be shut down manually. The group said that the clean-up of the radioactive water would cost the tax-payers millions of dollars in clean-up. The group suggested AECB should order a full investigation into the plant's safety. The director general of AECB, Mr. Ziggy Domarsky said that "the heavy water spill does not indicate that the Pickering reactors are in trouble. Our plants are designed to be able to handle this type of accident."

He also claimed that the Pickering plant is built to withstand an earthquake measuring 6.9 on the Richter scale even if it occurs directly under the reactors. But Mr. J. J. Wallach, a scientist with AECB, disagreed with Mr. Domarsky's assertion. In a scientific paper published in January 1990, he concluded that the ingredients for a major earthquake exist near the Pickering and Darlington nuclear power stations. He conducted aerial surveys that showed the presence of two anomalies on the floor of lake Ontario. The anomaly is "practically beneath the Pickering nuclear power station," he claimed This 100-page paper is supported by several geophysical maps that detailing various features. The evidence accumulated to date indicates the need to conduct as soon as possible, a ftill scale, fully integrated seismotectonic programme relevant to reevaluating the nuclear generating stations," Mr. Wallach said. But no such detailed investigation has been conducted so far, according to informed sources.

Indian Express December 22, 1994.

Interview with Dr. Rosalie Bertell

It is a great pity that illness prevented the proposed Indian visit of Dr. Rosalie Bertell. Below we are reproducing an interview she gave some years ago to Safe Food News—a US journal devoted to the cause of educating the public about the hazards of food additives and food irradiation.

Dr. Rosalie Bertell is an epidemiologist and Catholic nun who has been involved in environmental health for more than 25 years. She is the President of the International Institute of Concern for Public Health inlbronto, Canada. In 1986, she received the prestigious Right Livelihood Award for her work in "protecting human life and livelihood from ravages of industrialism." She is also the author of the critically acclaimed No Immediate Danger.

Question: How did you get started in what has turned into a life-long commitment to health and environmental justice?

Bertell: I started working on environmental health issues primarily because I was looking at the environmental and hereditary factors associated with an increase **in** leukaemia. In doing so I really discovered the whole world of medical x-rays and the problems they were creating. From there, I became involved in the **nuclear** industry, where I found out to my surprise and horror that **they** were allowed to routinely **release** radiation in to the environment, which, to quote the industry, "gave the people a radiation dose similar to x-rays," which were OK. because your doctor gave them to you. Then I started looking back and wondering who ever told them that it was OK. to give x-rays to people when they were not obtaining a benefit for it like they do with a medical x-ray. I then found out that the regulations for permissible levels were set by the military. So the whole thing kept becoming more and more involved and horrendous.

Question: It seems like many of our environmental problems have their roots in the military. It's hard to comprehend, however, that the military systems supposedly designed to protect us are also threatening our health and well-being.

Bertell: You're right. Many of the environmental problems we're experiencing have their roots in the military. Even the food irradiation programme. We have this addiction to militarism and military ways of thinking. I call it an addiction because it has all the classic signs of an addiction — it's secretive and exaggerated, it sacrifices health and social goods, and it takes the beet and the finest young brains in the country and drains them off into producing weapons of mass-destruction. This addiction to militarism is widely destructive and we are not confronting it.

When we talk about an environmental problem, we say that it is everyone's refrigerator, their underarm deodorant, or it's because they dont recycle paper. We don't say anything about the major things the military is doing to damage the life support system. It's something that we, as a society which is undermining our survival because of a distorted national security syndrome. In the past, it could be somewhat justified as a strategy, but it has now become a self-destructive addiction which needs to be unmasked.

Question: You've been a critic of the so-called "acceptable levels" of radiation exposure. In fact, you've called the acceptable radiation-exposure levels set by the nuclear industry a self-delusion. How did we get to a point where our regulators view certain cases of suffering, even death, as "acceptable?"

Bertell: I think what we're dealing with here is a rather bizarre definition of safety and it comes out of a mentality of risk-benefit trade-offs. Those people who bring us regulations have decided that the setting of regulations is not a public health function. So, regulations are not set in order to protect the public health or the welfare of future generations. That's the trade-off underlying the regulation. The regulation is meant to be a political statement that people accept the cost in life, health, and damage to future generations in exchange for the benefit of the activity. The benefits are economic and social. You have here a pseudo-science. While it is possible to come up with estimates of risks and also estimates of socio-economic benefits, it isn't logical for a society to allow the same persons who are obtaining the social and economic benefits to do the calculation of the risks. It's obviously a biased system. What we've done is said that the people who promote food irradiation, for example, and this applies in many other areas, are the experts. Therefore they can tell us the risks and they can tell us the benefits, and that is certainly an illogical system. What we really need are disinterested parties who speak for public health, the integrity of the gene pool and inter-generational equity. These are the people who should calculate the risks of the proposed activity while the producers of the proposed industry calculate the social and economic benefits, if there are any. Then we must have a public-political process which decides the trade-offs. It is the structure that is wrong. It is not a scientific method and it is not even an acceptable political method.

Question: In other words, our government and various responsible bureaucracies have failed to protect the public from environmental pollutants.

Bertell: Yes. I think environmental pollutants are falling in the cracks between departments of environment and the departments of health. The departments of environment are oriented towards chemistry or engineering. They have technical personnel who go out and measure the pollutant and then they look for some legal limit. The only things they are able to say in terms of health is that you might have a potential health hazard. They do not have the expertise to deal with it on any farther level. On the other hand, if you look at the health departments, they are trained in either one-on-one medical care or they know how to deal with distributing the flu vaccine or dealing with infectious disease. They are not, however, good at all with environmentally-mediated diseases, with diseases related to pollution of air, water or food. Also, they are not trained in environmental health or the kinds of community impacts to be expected when you release multiple toxins into a community's water supply, landfill or local fishery, for example. So you see you've got these types of situations without any bureaucratic body dealing with it. You also have the industry trying to avoid responsibility.

Question: In regard to the combined health and environmental problems facing us, you've said that the gene pool is being damaged at the same time that we're damaging the environment, so inhabitants of the planet are given a double burden. Could you expand on that?

Bertell: Part of the public health orientation is how far into the future do you care? You'll find that many members of the public and many people who deal with hazardous materials have a *very* short timeline of concern. If, for example, you go for an x-ray and you're not sick within 24 hours of the x-ray, it is judged as harmless. The time-span there is extremely short. If you take medicine like chemotherapy, then the timeline might be as long as a week or a month to see whether or not there are any harmful side-effects of the medicine. That's a little longer timeline.

People are now becoming conscious of the fact that an exposure could cause cancer in the next 20-25 years. That's an even longer timeline. What I'm asking for is the understanding that every person who will ever live on this planet is present right now in the sperm and ovum in the people that are living. So these are not nebulous beings who come from outer space, they are people connected to the people who are now living. If you expose yourself to toxic agents that damage the sperm or the ovum, it might take two or three generations or 70-100 years to show up, but it becomes inevitable once sperm or ovum are damaged that this will resurface as serious illnesses in the future.

So I'm looking at the fact that we are doing this kind of damage. We are recklessly releasing mutagens into the environment and c musing this kind of genetic damage It has not taken its total toll yet, eisher. In fact, the first two generations are only 25% of the expected damage. So at equilibrium, that will be four times as much damage coming.

I'm only trying to point out the fact that we have already done this real damage to the gene pool. At the same time we're making the environment more hazardous to live in because we're reducing the quality of air, food and water, and this is the life support system. You can't do both of these things at the same time without introducing species death syndrome. You cannot damage the ability to cope and then give the individual more to cope with and expect to increase life expectancy and the quality of life. It is going to decrease.

Question: It seems like so many of the bureaucrats and corporate executives of polluting companies have forgotten how precious life is and how their decisions impact upon life.

Bertell: They often consider people easily replaceable. They seem to say, "Oh, well, have another baby if this one is damaged." It is a very callous approach to the uniqueness of each human being. And I do not mean just human life, I also mean animal life.

Question: You once called food irradiation "scientifically outrageous and humanly exploitative." Would you elaborate on that?

Bertell: The purpose of food irradiation is to make money for the food producers and the nuclear industry. I think that it's a pseudo-scientific solution, especially in that the radiation-sensitive bacteria or microbes in the food are also the same things that tell you the food is stale. So, food irradiation kills the organisms that produce the odour or change the colour to give you the clue that the food is stale. You never wipe out all the bacteria or microbial life with irradiation because, if you do, you make it limp, colourless and tasteless and it wouldn't be saleable. Therefore, you're only killing a part of that ecosystem and the part that you leave alive **is** apt to be even more damaging to health than the kinds of things that give you a clue that the food is stale. For example, the micro-organism that causes botulism is among the most radiation resistant. As you destroy part of an ecosystem, the surviving microbes that are left fill up the system — they grow without competition.

Safe Food News Fall 1992

Subscription Infarmation

Rs. 30/-per year (6 issues) within India
U.S. $ 15/-per year or equivalent in other currencies for airmail overseas.
Rs. 500/ - for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Published by S Gadekar for Sampoorns Krnnti Vidyalaya and printed at The Parijat Printry, Ahmedabad

PRINTED BOOK

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 8 Number 4 February / March 1995

Myths about Power

A macabre myth has been doing the rounds in the country: that India will have to double its installed capacity from its existing level of 66,000 MW to 140,000 MW by the year 2005. This as 'experts' in the Union Ministry of Power will be only to glad to explain, will involve total investments of Rs. 245,000 crores at current costs. Since India cannot raise such vast sums of money, it must look to richer countries (read multinational corporations) for funding support

The Ministry of Power is wrong. So are some of the most ardent defenders of such myths. True, their estimates are baaed on a growth of 6.5 percent per annum in the demand for power. But they fail to realise that India does not suffer from any shortfall in power generation capacity. It only suffers from the problem of power utilisation.

An analysis by Prof. Michael E. Porter (the renowned management guru) and Prof Pankaj Ghema wat of Harvard Business School shows up two important points: (a) that India does not produce as much power as it should, and (b) that India does not use all the power it can produce. In their stucty, they also arrived at the conclusion that of the 65,000 MW of power that it can produce every year, India actually finds itself using barely 21,000 MW of power annually, (see table next page)

As much as 7,800 MW of power is lost every year because of planned maintenance. Since such maintenance cannot be avoided, if power plants are to be run at their optimum levels over a period of time, this is a loss which India's planners must accept as being inescapable.

* That leaves India with 57.000 MW of power. But even at this stage the country is confronted with the problem of the manner in which unplanned repairs take place, which collectively account for a loss of an additional 10.400 MW every year.

* Lack of logistic support in ensuring timely availability of coal and other requirements causes an annual loss of 9.800 MW.

* Around 1.000 MW a year Is Just not used because the state electricity authorities have not managed their respective power consumption patterna effectively enough.

* Lastly, a whopping 15.000 MW of power ia allowed to slip away through transmission and distribution losses.

* It is because of the cumulative effect of losses at every stage, that India ia in a position to use Just 21.000 MW of power every year. Even If one discounts for loss of capacity utilisation due to planned maintenance, one still arrives at a total avoidable loss of an Incredible 36.200 MW of power every year.

The magnitude of the loss can be better comprehended if one

Stage	Power Available	Loss	Causes
1	**65,000**	**7,800**	**Scheduled unavailablity / planned maintainance**
II	**57,200**	**10 400**	**Unscheduled unavailability / unplanned repairs**
HI	**46,800**	**9,800**	**Forced outages due to lack of coal etc.**
IV	**37,000**	**1,000**	**Power not used**
V	**36,000**	**15,000**	**Transmission and distribution losses**
VI	**21,000**		**Net available power**

urea it by a proper yardstick: the Governments first (reckless) award of a power generation project to Enron. The total amount of power lost in India is equivalent to 18 Enron projects. Alternately, working on a normative cost of 3.4 crore per MW for all private sector plants which have been guaranteed profits by the government, the government could have saved Rs. 126,700 crores by not installing additional power generating capacity. But then if such losses were contained, how could India's bureaucrats in the power ministry and the prime minister's office, as well as the ministers themselves bestow largesse on their favourites!

Not Out of Ignorance

The above facts are known to the government. That is why India's planners thought it fit to set up the Power Finance Corporation almost a decade *ago* to refurbish old and ailing plants. That is why some planners insist there is a crying need to let the private sector take up ailing plants on lease for 15 years or so, and help turn them around. That way, the government could save as much as 36,200 MW of power every year.

Yet the government does precious little about reconditioning existing power plants. It is in a hurry to award even more new power projects to private sector entrepreneurs. The centre's recklessness has been matched by the MoU mela recently introduced by the state governments of Andhra Pradesh and Karnataka.

The reasons for such aberrations are not hard to find. Obviously, when such large sums of money are involved, why bother if the country loses Rs. 36,000 crores every year?

That is how, despite all the talk about power, the people of India are condemned to a state of continued powerlessness.

R.N.Bhaskar
Indian Express 272.1996

Editor's Comments:

This article makes no mention at all about nuclear power. That is but natural, since in any serious discussion of the power situation in India, nuclear power which contributes a mere two percent of the capacity and much less than two percent in terms of electricity, just does not count.

Transmission and distribution losses are generally said to be around 20—25 percent in India. The figures quoted in the table seem to say that this figure is not really correct. While these losses are 25% of the total capacity, they are an enormous 42 % of the electricity actually being produced. I would be surprised if any other country in the world conies close to us in such profligacy.

Manohar Singh

Anumukti deeply regrets the untimely and painful death of Shri Manohar Singh of Tamlao village. He was a brave man who fought his misfortune with courage and fortitude. His outspoken condemnation of nuclear power operations gave courage to many others. Below we reprint his story in his own words:

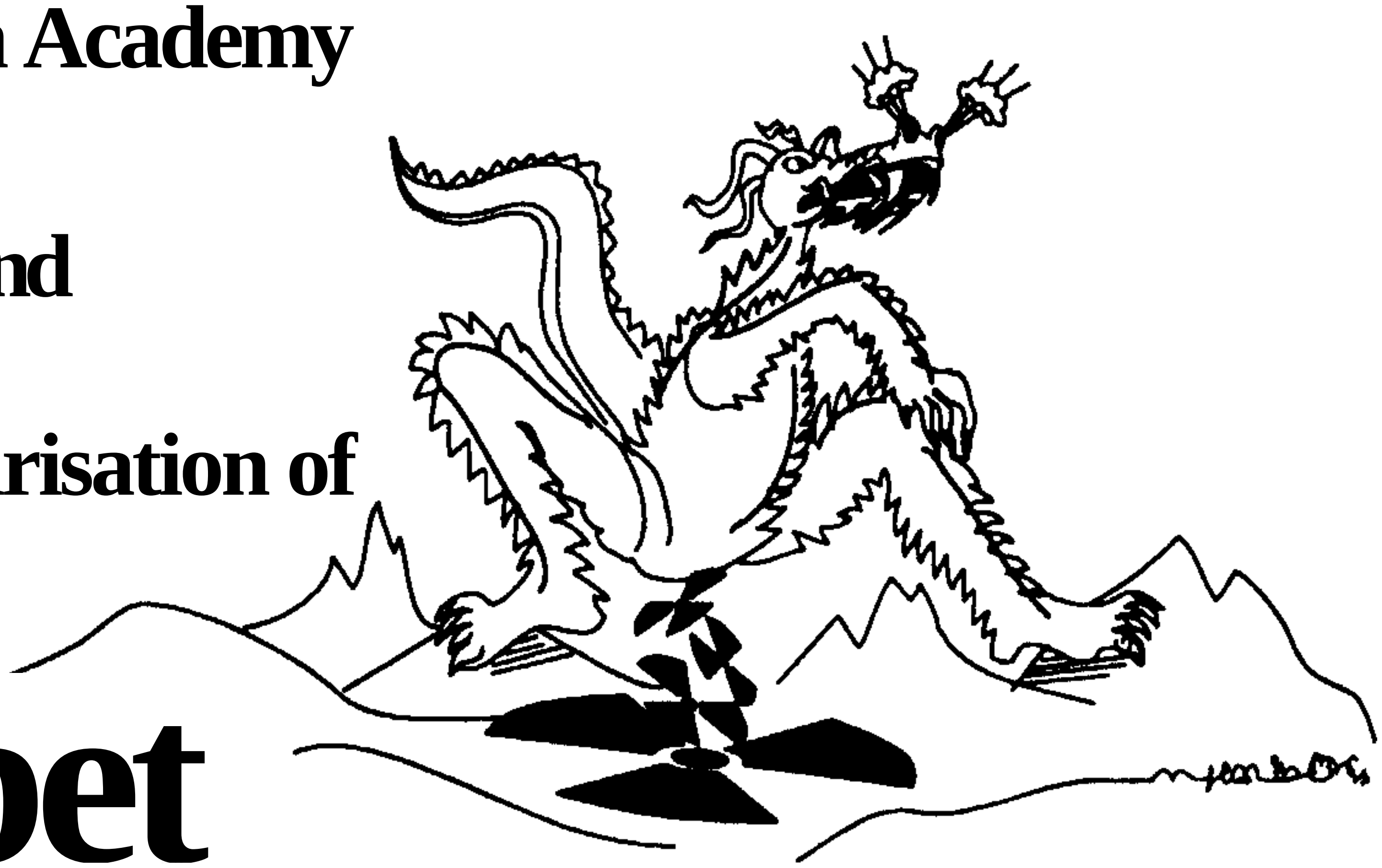
"I used to work in Waste Management. Once, I received a dose of 2,200 mrem in half an hour. Others have been laid off after getting a dose of 800-1,100 mrem. Most workers get this much dose in six to ten days of work. One needs to work for just half an hour to one hour every day. You receive more exposure during shut-downs. The work involves moving material. Machines are used for heavy loads, but if the load can be lifted by one or two persons, then machines are not used. My lungs have become bad. I dont smoke. I have gone to many different hospitals for treatment They treat you for T.B. After a few days, the doctor tell you to stop taking the drugs. Then, they restart the treatment all over again. I have developed these burn-like red marks (keloids) all over my body. One of my mates in the plant, suffers from exactly the same problem. I have a seven year old son. He was born with a sternal deformity. Ever since birth his rectum comes out when he shits. Despite knowing the dangers of working in the plant, people go there because they get better wages. If I have to starve, I will starve, but I will not work at RAPS."

The Ninth Academy

And

The Nuclearisation of

Tibet



Tibet, the high plateau in the magnificent Himalayas, the land where many major rivers of the region including the Brahmaputra (Tsangpo in Tibet), Indus and Yangtze originate, has been a victim of the nuclear madness. It is an irony that the land of the gentle Buddhists is being ravaged by nuclearisation. We give below some extracts from a comprehensive report, NUCLEAR TIBET, by the International Campaign for Tibet (ICT) which is a Washington-based, Tibet monitoring advocacy group. The report is the result of a year-long research effort. The methodology of the report included library research of Chinese and English language materials; interviews with Chinese nuclear experts, government officials and Tibetans, fact-finding missions, laboratory sampling of soil and biotic materials; and measurements of selected sites for radioactivity with Geiger counters. The Report is dated April 1993. In this article, we focus on just the Ninth Academy—the nuclear weapons research facility. We will have a separate article on the other Chinese nuclear activities in Tibet in a future issue.

Highlights of Nuclear Activities in Tibet

The nuclear activities of the occupying Chinese authorities include:

- Building a top-secret nuclear city, the "Ninth Academy" where moat of Chinese nuclear weapons were designed and inbricated.

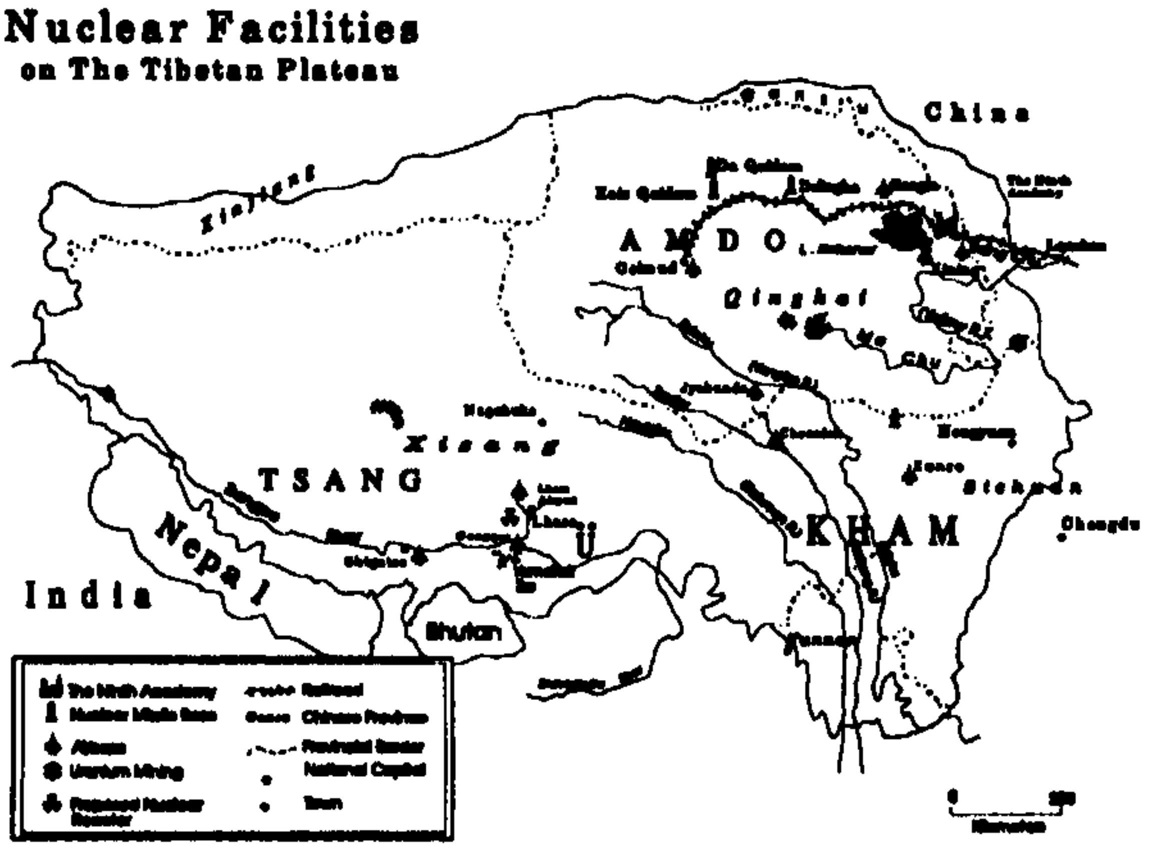
* Dumping an unknown quantity of radioactive waste from this facility, and near uranium mines. There are credible reports of illness and death among tribes In the area.

Deploying nuclear weapons in at least three sites, one of which Is accessible only by a rugged dirt road posing transportation risks. By these deployments of nuclear missilles and facilities. China has negated the historical buffer tone role of Tibet.

Aliegations of dumping of other countries' nuclear waste wars unconfirmed. But the resesrch team thinks that though this is unlikely to have happened in the past, it is vary possible in the nature. Shipment of high-level Taiwanese nuclear waste to China for disposal is very likely and that waste may go to the Tibetan Plateau, according to credible sources.

There is also a proposal to build s nuclear reactor in Lhasa to meet the increasing energy demands of Chinese settlers and enteterpries.

Chinas nuclear programme is only a fraction of the size of those of the US or the ex-USSR in terms of the nuclear arsenal, number of test axplosions and the volume of nuclear waste generated. But in the areas of nuclear proliferation, lack of worker safety and irresponsible waste disposal, China's record is as poor or even worse than those of other nuclear powers. The implications of this situation for Tibetans, Uygurs and Mongolians is truly frightening. Any movement toward making Tibet a nuclear free zone, as proposed by the Dalai Lama and others, will have to address the nuclear ambiguities between China, India and Pakistan and each of their security needs.



The Ninth Academy

The Northwest Nuclear Weapons Research and Design Academy was called the "Ninth Academy" because it was under the jurisdiction of the Ninth Bureau. It was constructed in the early 1960's in the Haibei Tibetan Autonomous Prefecture, Quinghai Province, Haiyen County, near the shores of Lake Kokonor. Parts of this huge facility are located underground to deter detection and possibly attacks. All the functions of the Academy are not known But it is clear that it was responsible for designing all of China's nuclear bombs through the mid-1 9701B. For this purpose the facility designed and carried out non-nuclear explosions. It also served as a research centre for detonation development, radiochemistry and other weapons related activities.

Although its primary function was research and design, it also assembled components of nuclear weapons. According to Indian researcher, S. Devakinandan, the plant produces approximately 300 kgs, of weapons grade uranium and that China's hydrogen bombs were probably fabricated at Haiyen. The Ninth Academy is one of China's most closely guarded secrets and rarely mentioned in Chinese or Western publications.

History of Ninth Academy

China's occupation of Tibet began in 1949. In 1968 the Chinese Communist Party's General Secretary Deng Xiao Ping formally approved construction at the site. By the end of that summer, over 10,000 construction workers were working in the sheltered valley to the east of Lake Kokonor. Geographically, the area is a high altitude desert and was called "gold and silver sand". Due to the isolation and climatic factors of the site this construction force was found insufficient. Authorities reinforced the work-force by including prisoners. The use of prisoners to construct industrial infrastructure is well documented in Communist China and Qinghai is considered China's "Siberia". Harry Wu, a former prisoner and China prison expert, reports that labour reform camps in Qinghai use prisoners to excavate radioactive ore and they are forced to enter nuclear test sites to perform dangerous work.

The Ninth Academy was partially opened in 1963 and was fully operational by 1967, during the Cultural Revolution. Prior to the opening of the Academy, nuclear weapon design was conducted at the Beg ing Weapons Research Institute. After the Academy was opened, the top scientists and the principal work were relocated from Beijing to the Tibetan Plateau.

Nuclear Weapons Production

In 1964, the Ninth Academy conducted the first 1:1 model blast experiment at a site near the facility. China's top nuclear scientists continued to gather at the Ninth Academy to refine, update and develop all of China's nuclear weapons technology through the late 1960's and early 1970's. In the late 1970's, the Academy established a Chemical Industry Institute which conducted comprehensive experiments" on reprocessing highly enriched uranium fuels. In the area of low-concentration fuel reprocessing, the Academy's vertical shearing machine had a daily processing capacity of as much as 400 kgs of uranium. In 1987, China disclosed some more information about its highly secretive nuclear programme in a book, *Con-*

temporary China's Nuclear Industry, by Lie Jue et al. Lie Jue was the men instrumental in selecting the locale of the Ninth Academy in the Tibetan Plateau. In late 1991, the most authoritative publications maintained that the Haiyen facility was "still China's main nuclear weapons research and design centre. However, it appears that various functions of the Ninth Academy were gradually moved to different locations, mainly to Sichuan Province to the south, where they remain today. It is possible that all of the Academy's nuclear functions were moved away from Haiyen by or during the 1980's. Tibetans in the area who were interviewed said that many of the soldiers guarding the facility were removed in themid-1980's.

The economy of the Haiyen County is dominated by the Ninth Academy. But there is substantial agriculture and animal husbandry activity. Per capita income is more than double that of other counties in Qinghai. Heavy industrial output is 72 million yuan, about seven times that of surrounding counties. These figures are likely to account only for the supporting infrastructure of the facility and not for the output of the facility itself

Radioactive Waste and Health Effects:

The nature and quantity of radioactive waste generated by the Academy is unknown. Waste disposal methods have been reported as being extremely casual. Initially, waste was put in shallow, unlined landfills. Since no records were kept, the nature and location of much of the waste will be extremely difficult to ascertain. Understanding the hydrology and geology of Haiyen county will play an important role in assessing the methods and pace of the haxardous dispersal of the radioactive waste.

The shallow landfills created in the 60's and 70b may be leaking into the groundwater and watershed at a faster rate now than in the past years. Underneath the Ninth Academy are a series of natural aquifers, which are charged and replenished by surface waters, streams and underground streams and sometimes comprise of underground lakes. Underground water supplies in Qinghai have been diminishing at a rapid rate and usable underground water is very limited. This may make any radioactive contamination of ground water a matter of great concern.

On the peaceful nuclear front

Full Steam

China plans a rapid expansion of its nuclear power generation programme. This makes it the most promising market for nuclear suppliers. Presently three nuclear power stations are operating, one at Qinshan near Shanghai with a capacity of 300 MW and another at Daya Bay near Hongkong with two reactors of 900 MW each. A district heating system with energy provided by a small nuclear reactor of 5 MW is operating in Beijing.

By 2010 China hopes to have an installed nuclear capacity of 15,000 to 20,000 MW. At present more than ten provinces plan to build nuclear power stations and have conducted site selection. Advanced planning has been made in Guandong, Liaoning and Zhejiangprovinces.

There have been no known systematic studies of health effects of the Academy. There have been periodic stories about mysterious and unnatural deaths around Lake Kokonor. But they have been not specific enough. Some of these reports came from a Tibetan physician who lived in the area. In 1984, a Tibetan doctor, Dr. Tashi Dolma was sent to the Academy to take a blood sample survey which was part of an effort to prove that Tibetans were genetically and inextricably linked to the Chineee. Dr. Tashi Dolma and other physicians sampled over 2,000 people from three counties. But the samples were never analysed for effects of radiation. In two villages, Reshui and Gansihe, Tibetans reported to the medical team that there were strange diseases in their villages. These villages were closest to the Ninth Academy. But the team was not allowed to pursue these reports further. Dr. Tashi Dolma also worked in a hospital in Chabcha (Gonghe in Chinese) in Hainan Tibetan Autonomous Prefecture directly south of the Ninth Academy. There, Dr. Tashi treated Tibetan nomads whose sheep graced near the Academy. The children were found developing a cancer that caused their white blood cell count to rise uncontrollably. Seven of the children , aged 7-14, died during the five years she was at the hospital. A doctor from Pittsburgh, whom the I CT has been unable to locate, reportedly came to Chabcha to conduct research at the hospital and told Dr. Tashi that these symptoms were similar to cancers which followed the bombing of Hiroshima and Nagasaki. Tibetans interviewed in the area in September 1992, said that meat from animals in the valley surrounding the Ninth Academy was banned by authorities from stores. "Everyone was told not to eat the meat from there, but not told why." One parson complained that the meat was much more effectively kept away from the Chinese communities in Qinghai, but impoverished Tibetan sometimes ate the meat out of ignorance or necessity. It is unlikely that nuclear waste from China or abroad would be disposed far from the railway line that leads west into Amdo. That railway line crosses headwaters of the Yellow River - but not the river itself- at the Ninth Academy and elsewhere.

The only other potentially dangerous activity likely to be in the headwaters of the other rivers is uranium mining which does not produce the high-level waste which poses significant threats to populations far downstream. Another potential threat would have been the nuclear plant that was planned for Lhasa on the headwaters of the Brahmaputra, which would have produced high-level waste. But its construction has been cancelled, at least for the time being.

Unsafe waste disposal practices from the Ninth Academy threatens health in Xining, located approximately 70 miles downstream and inhabited by more than 700.000 people. The section of the Yellow River downstream of the Ninth Academy has been documented as containing huge quantities • approximately 100 tons - of liquid mercury. The mercury is believed to come from the nuclear facilities located further downstream at Lanzhou, Gansu Province, which lies at the base of the Tibetan Plateau. Liquid mercury is one of the principal waste products of military nuclear weapons development. During the 1960's and early 70's, China dumped enormous amounts of liquid mercury directly into the rivers. Mercury and other highly toxic solvents are commonly mixed with high-level military waste resulting from plutonium production. Even the Chinese official records on nuclear development admit that their attempts to dispose of mercury waste from nuclear military development "were rather poor". River section in Gansu, directly downstream from the Tibetan Plateau, also contains phenol and arsenic more than 11 times the permissible standards.

Waste in Lake Kokonor

In the former Soviet Union, disposing of nuclear waste was often done by dumping it into the nearest water-body. This practice was partially due to the frantic nuclear preparation for the Cold War. The pace was equally, if not more frantic in China. As a result, many nuclear experts fear that China engaged in some of the most dangerous disposal methods such as dumping waste directly into the rivers and lakes. This waste management philosophy and practice -"dilution is the solution to pollution"- is still widespread in China.

Lake Kokonor (Qunghai Hu in Chinese) , the largest salt water lake in Tibet, is located 10 miles east of the Ninth Academy. A railway line leads directly from the plant to the lake and stops at the water's edge and could have been designed by the Soviet advisors who helped build the facility. The line may have been used to dispose barrels of waste. Experts speculate that this rail line may have been used to dispose radioactive waste when the waters of the lake was higher. Galen Rowell, an eminent Himalayan photographer and naturalist, remembers seeing this rail line in 1980, along with unusually heavy truck traffic in the area, neither of which he could explain at that time.

The ICT received numerous reports of top-secret military manoeuvres on Lake Kokonor in the early 1970s. One came from a Chinese man whose father worker as a nuclear scientist and was living in Lanzhou in the 1970's. According to this man, there was an accident involving nuclear pollution of Lake Kokonor in 1974. Fishing was banned temporarily and at least the scientific community in Lanzhou refrained from eating fish from the lake for many years as a result of the accident.

Public Opposition

The security concerns for the Ninth Academy included rebellions by Tibetans against direct Chinese rule. Tibetans have a long history of protest against Chinese domination in Qinghai. Qinghai was run by a Muslim warlord, Ma Bufang, during the first half of the Century and was independent of any Chinese rule. Construction of the Ninth Academy displaced some villagers, nomads and monks. Though there is no record of fighting and resistance around Haiyen, some of the fiercest resistance has come from the Golok nomads who live south of the Lake Kokonor. Maps show that there were several Buddhist monasteries in the vicinity which were destroyed and have never been rebuilt, probably due to their proximity to the sensitive facility. From the orientation of its fortifications, it appears that the facility was prepared for an attack from the south of the Lake. Now one finds abandoned trenches, bunkers and barbed wire.

China has, sometimes, simply created a separate administrative district to side-step a local government that may pose problems, or established a friendly local government. Both these tactics have been used in Tibet. For example, to facilitate the construction of the Ninth Academy, the authorities "set up" a friendly local government. Parcels of land for nuclear missiles sites were also removed from the jurisdiction of prefectures, made into their own administrative unit and controlled directly by Beijing.

K.Krpa

Mescalero Apache Tribe Votes Down MRS

In a vote that shocked the nuclear power industry, the Mescalero Apache tribe January 31 decisively rejected a plan to build a radioactive waste dump on their land. The plan, promoted by nuclear utilities and tribal leaders, would have established a private "monitored, retrievable storage" facility for high-level nuclear waste on the tribe's New Mexico land. The final vote was 490-363, or 58%-42%, against the proposal. The question drew a record voter turn-out for the tribe.

The size of the margin against the dump, and the record turn-out, appeared to leave little option for the 33 nuclear utilities which had hoped to set up a private nuclear waste dump, or at least create a viable radioactive waste alternative if current efforts fail to force US taxpayers to take the waste by 1998. Indeed, the day after the vote, Northern States Power (NSP) lobbyists already were at work in the Minnesota legislature seeking new concessions to allow the utility's nuclear reactors to operate beyond 2002. Northern States Power was a key mover in the effort to site a dump on the Mescalero land Last year, the Minnesota legislature narrowly approved construction of a limited number of dry cask storage units for NSFs Prairie Island reactors, while setting up a method for the utility to switch to renewable energy sources and close its reactors.

The industry's Nuclear Energy Institute appeared to concede further defeat on the private MRS concept, saying that the vote made it imperative for Congress to act this session to require the Department of Energy to build an "interim" nuclear waste storage facility by 1998. Senator Bennett Johnston (D-La) has introduced S.167, which would require construction of such a dump at Yucca Mountain, Nevada.

The Mescalero's clear rejection of the MRS appeared to take the industry by surprise. The project had the support of the tribal leader, Wendell Chino, and the tribal council. But in the days before the vote, opposition efforts led by Humans Against Nuclear Dumping, a Mescalero-based group, and Joe Geronimo, grandson of the legendary Apache leader, began to turn the tide. Nearly every Mescalero household received fact-sheets prepared by Nuclear Information Resource Service, and heard donated radio ads - in Apache -from Geronimo.

The size of the anti-dump vote appeared to preclude concerns that Chino and the tribal council might attempt to force the MRS on the tribe anyway. Indeed, Chino now may face a battle over tribal leadership. However, there were rumours that Chino might press for a second vote, with substantially increased funding from nuclear utilities. Unconfirmed reports indicated that Mescaleros were told that they could receive $2,000 for switching their votes in favour of the dump.

The Nuclear Monitor February 13, 1995.

HIGH COURT ORDER
THE LAND IS OUR MOTHER

Not Only Through Radiation

"What lf :A Case Study of Kaiga

Normally when one thinks of a nuclear accident or a safety hazard during its routine operations, what immediately comes to mind are only the radiation hazards. Compared to these, the non radiation ones may even seem trivial. On the one hand, the first reaction of the nuclear establishment in any accident is that it has no radiation impact! Even the Chernobyl accident has been dismissed by Dr. Raja Raman na (the erstwhile chairman of the Department of Atomic Energy) as a "curious fire accident". There are several experts in the Health Physics Division of Bhabha Atomic Research Centre who are willing to assure us that the genetic damage and deformities at Rawatbhata are due entirely to non radiation causes. Also our most recent nuclear accidents, the fire at Narora, the flooding of Kakrapar and the crash of the Kaiga dome, have opened up the possibilities of genuinely non radiational but nonetheless serious hazards arising from our nuclear power stations. This perhaps is a unique feature of the Indian nuclear programme.

However, the fundamental reason for studying the non radiational accidents is that they raise disturbing, What if questions. What if the Narora fire had spread another 50 feet, with all the safety systems inoperative? What if the Kakrapar flooding had occurred when the reactor was running? What if the Kaiga Containment had collapsed onto a critical core and damaged it? One can also use the non radioactive accident as a pointer to the safety culture in the nuclear establishment. Analysis of the causes and the way such accidents are handled, provide us with valuable insights into how real, radioactive accidents will be managed by the establishment and the level of public safety that one may expect during such emergencies.

The Unthinkable Crash

On Friday, the 13th of May last year, the inner containment dome of the first reactor at Kaiga caved in for no immediately discernible reason. Reports said that concrete slabs weighing several tens of thousands of tonnes came crashing down from a height of about 40 meters, the height of a 12 storied building, Normally the containments of nuclear power plants are built strong and are built to last. They are supposed to withstand not only the intense radiation from within but also natural disasters like hurricanes and severe rain. They should not be breached even in case of a massive earthquake of the magnitude of 6.5 or a bomber attack by air. In the last earthquake at Kobe, Japan, there were 11 nuclear reactors in the quake hit area. All of them survived, shutting down safely. (However, none were near the epicentre of the crash. If the epicentre had been a hundred miles to the north where most of the reactors are located it is unlikely that the reactors would have survived, since the earthquake produced accelerations which were for in excess of design basis of the reactors,—Editor) But in India, we have containment structures which do not seem to withstand their own weight! The very strict requirements of integrity are necessary because, despite claims of Defence in Depth, containment is the sole barrier between the radioactive core and the environment. The collapse of a containment dome in any reactor at any stage is simply unthinkable.

Implications

To understand the true implications of the Kaiga accident, one has to ask what would happen if the containment of a working reactor comes crashing down. The worst possible accident scenario in a nuclear power plant is a core out of control coupled with breached containment. In the case of Chernobyl, the reactor core went out of control and blew the containment, whereas in Kaiga the sequence would be in reverse, but the end result would be the same. The falling debris of the dome would damage the core, the coolant pipes, and many of the safety systems as well. With cooling and safety systems inoperative, the core will suffer a loss of coolant accident. With the containment already breached, the result would be a nuclear disaster of the same magnitude as Chernobyl.

Various possibilities come to mind when one looks for the causes of the accident. Kaiga after all is a Government building and no one needs two guesses as to why Government buildings collapse during construction. On the one hand NPC claims to have procured the best quality construction materials, and on the other, the people of Karwar claim that the local markets are flush with huge quantities of the same high quality cement and steel. Investigative reports have been published detailing several corrupt practices at the site, including the diversion of materials. It should be noted that the fire station building at Kaiga had also collapsed earlier.

So What if the Roof has collapsed !
The Engine is still working
Kaiga Rambharose Trav

The Official Explanation

The official explanation of the dome crash is equally damning. It has been admitted that the design of the dome was changed at the site. But the serious safety questions raised by this admission have not been answered. Who decided to change the design? Were they authorised to do it? More important, were they competent? What kind of safety culture prevails in the nuclear establishment where something as critical as the containment design can be changed by incompetent and unauthorised persons? Was the AERB clearance taken for the design changes or was it bypassed altogether? What is the value of the claims made both by AERB and the NPC that all major design aspects of the power station are audited by the AERB have not been ignored by the NPC?

Nucteocratic Mindset

It is also important for us to analyse the response of the nuclear establishment. The reactions from its senior officials can be grouped into several attitudinal categories.

The first response was to hush it up. The injured were immediately taken out of the reactor building which was sealed. Till today the death toll has not been disclosed. Normally at least a hundred workers are inside the dome at any given time. We have been told that (by God's grace, no less) the dome crashed during the lunch hour. Lunch break at 11.45 AM at an Indian construction site strikes one as an innovative idea.

The Real Surprise

There are two committees appointed separately by the NPC and AERB to investigate the accident with an assurance that they would submit their reports within three months. No one is certain as to when they will do so. Recently Dr. Gopalakrishnan, Chairman AERB has made the remarkable admission that the delay is due to non availability of important documents from NPC. This is not surprising. The real surprise is that AERB is actually insisting on documents from NPC. But no matter when released, one thing we can be certain of - both of them will be suppressed. There is a saying: He who has a secret to keep, keeps it a secret that he has a secret to keep! Therefore, even the fact that there is an official report on the accident will be suppressed so that no one would think of asking for it!

The Veil of Darkness

At no point of time did the NPC take the local administration into confidence. The Karwar District authorities were informed of the accident only late at night. The injured were kept incommunicado in the hospital so that they did not talk. Till today no group of citizens or the local administration has been permitted to see the damage.

Allaying Public Pears

When the news broke out anyway, there were attempts to trivialise it. This comes under the favourite pastime of the nuclear establishment viz., "allaying fears in certain sections". The crash of the dome was described in the officialese as "certain sections of the containment getting delaminated". When repeatedly asked about such an accident in a working reactor, some of the most bizarre explanations have been offered for the accident. A few samples are

a. Not even a spec of cement would have got into the core.

b. So what? If the roof of your car gets blown away wont the engine be still working?

c. What if one dome collapses? We have another dome around it!

Given the seriousness of the accident such frivolity can only be described as irresponsible and in extremely bad taste.

Serious Repercussions

In a more sophisticated attempt to gloss over the failure, it was stated that the dome was undergoing prestressing at the time of collapse. In reality the dome construction was over nearly four months earlier. The NPC's desperation in the matter is indicated by the fact that even the Prime Minister has been fed with this piece of misinformation.

In a case of a real accident, such bureaucratic attitudes can only lead to serious repercussions for the safety of the general public. While openness, accountability and transparency are desirable at all times, they are of critical importance in the event of a massive nuclear disaster where large populations have to be evacuated in a short time. It also demands perfect co-ordination with the local administration and other agencies. But if the ostrich like attitude displayed during the Kaiga dome collapse is any indication, the nuclear establishment is more likely to be busy denying or trivialising the seriousness of the accident, jeopardising the life of thousands.

Too Hot to Handle

Kaiga is also unique in posing non radiation hazards even without an accident. One such hazard which is not generally understood is the thermal pollution. Much has been said about the folly of setting up a reactor complex in the middle of a tropical rainforest. This has been countered by the nuclear establishment with claims of minimal damage to the ecosystem. Figures like "only 125 hectares of forest will be lost because of the project" have been touted but have already been proved hollow.

A nuclear power plant is essentially a boiler with highly radioactive nuclear fuel which generates tremendous amounts of heat. The heat is used for boiling water which in turn runs a turbine. In this process, only about one third of the heat is converted to electricity. Thus for every unit of electricity is generated, two units of waste heat is also put out which must be dissipated in the environment. A 235MWe reactor at Kaiga produces about 470,000 units (KWh) of heat every hour which will be released into the surrounding rainforest. This is equivalent to the heat required to heat 4 million litres of ice cold water to its boiling point.

The environmentalists were assured earlier that there will not be any cooling towers in Kaiga spewing out enormous quantities of steam into the valley. This decision too has been reversed. If the planned complex of six reactors is actually carried out in Kaiga then we would be releasing the heat equivalent of 24 million litres of boiling water every hour into the rainforest. The nuclear establishment in India is blissfully unaware of any tropical environmental issues and has done no studies on the hazards of thermal pollution from its plants in Kaiga. The sloppily done NEERI report has also ignored this important point. Tropical flora and fauna are very sensitive to the heat content of their environment. The impact of such massive heat release will be a total destruction of the ecosystem. The only redeeming aspect is that because of poor siting and management, the Kaiga reactors will be shut down more that 50% of the time and consequently the heat pollution will be less to that extent.

Transmission Line Vandalism

Another non radiation hazard to the Kaiga reactor is the deforestation being carried out in the name of transmission lines. Through a series of multiple sub contracts the clearing of forests and encroachment of private properties for laying transmission lines is taking place in Karwar district. There is widespread resentment in the region against this vandalism and people are organising themselves to launch an agitation.

In conclusion one can say that non radiation related hazards of nuclear power plants are real and significant. The analysis of the Kaiga dome collapse reveals the absence of accountability and lack of safety culture among the nuclear agencies in India. The implications of such complacent attitudes during a major accident should be a matter of grave concern. Nuclear power plants also pose serious thermal pollution problems which will lead to a total destruction to the sensitive ecosystem in Kaiga.

Sanjay Havanur

The AERB Column

Some Generic Safety Issues of Indian PHWR Stations

An article from Dr. Gopalakrishnan, the Chair of the Atomic Energy Regulatory Board seems to have become a regular feature of Anumukti. The following are some excerpts from a speech he recently made at a seminar on Nuclear Power and the Public Safety organised by INTACH in Delhi. They detail some of the safety issues that are common to all Indian nuclear power plants with the exception of Tarapur.

Inservice Inspection of Reactor Coolant Channels.

Recognising the possibility of failure due to contact between the pressure tube (PT and the calandria tube (CT), as a result of garter spring movement, Atomic Energy Regulatory Board (AERB) has directed the Pressurised Heavy Water Reactor stations to carry out inservice inspection (ISI) of coolant channels on an urgent basis. The following criteria have been adopted for the prioritised selection of channels for inspection:

a) channels having history of failed fuel bundles

b) the high-flow and high-power channels in the central zone

c) channels near adjuster rods, and

d) channels which exhibit high creep deformation.

Based on the above considerations, the Rajasthan and Madras atomic power stations have carried out ISI of 16 & 14 channels respectively, using an indigenous tool (BARCIS) specifically developed for this purpose. The results reviewed and suspected channels were defuelled and quarantined. MAPS was asked to carry out chemical decontamination of the Primary Heat Transport system before undertaking the next campaign of ISI of MAPS-1 coolant channels. This has also been done and the results are presently under review.

End-shields of earlier generation PHWRs.

The two units of RAPS and the first unit of MAPS have their End Shields made of 3.5% nickel steel. Contrary to the original design expectation, it was found that this material gets embrittled at a much faster rate. However, the material of end-shields from MAPS-2 onwards has been changed to austenitic stainless steel. Feasibility studies are underway for replacement of the embrittled end shield. In the meantime, in view of the leaky south end shield of RAPS-1, the regulatory body has restricted RAPS-1 operation to 50% Full Power.

RAPS-1 Calandria Over Pressure Relief Device (OPRD):

During the early seventies, OPRD of the Douglas Point Nuclear Power Plant in Canada had developed a leak. By the time this fact came to be known, RAPS-1, whose design is similar to that of the Douglas Point NPP, had already started operating and the OPRD became inaccessible. For subsequent NPP's the OPRD has been located in accessible areas, so that appropriate maintenance and inspection can be carried out without difficulty.

As at Douglas Point, the nickel gasket employed in the OPRD of RAPS-1 also developed a leak, forcing the unit to be shutdown. As an interim measure, certain operational stipulations such as imposition of a modified dump tank pressure control and ensuring the availability of calandria vault dryers, have been made. Meanwhile, an action plan for repair of the leaky gasket is being pursued,

Damaged inlet manifolds of MAPS Units

During 1989, the moderator inlet manifolds situated inside the calandries in both units of the Madras Atomic Power Station (MAPS) suffered damage, forcing shutdown. Detailed evaluation of the extent of damage was carried out.

NPC approached AERB with a proposal to modify the flow path in the moderator circuit and operate the units at a reduced power level. This proposal consisted of cutting and balancing the existing 8" size calandria inlet line and rerouting the outlet line to convert it as an inlet line. Moderator pumps then take auction only from the dump tank. Fast pump-up logic would be kept inhibited, while the maximum moderator outlet temperature at heat exchanger outlet would be restricted to 65 degrees Centigrade.

After review of the proposal and taking into account the modified stress contours and thermal hydraulic performance, permission was accorded for operation of both units of MAPS in the modified mode at 75% Full Power as an interim measure.

Meanwhile, studies are being carried out with the help of the Indian Institute of Technology (IIT), Bombay to determine the flow pattern of moderator in the modified mode and the consequent thermal effects on the rolled joints. The determination of the heat transfer coefficient in the flow mode, estimate of the average tube sheet temperature, and determination of the pull-out strength of rolled joints at the elevated temperatures etc. will form part of these studies.

A Gopalakrishnan and
S.V.Kumar
Atomic Energy Regulatory Board

The Pileup at Pickering

A serious nuclear accident on December 10 caused the emergency core of coolant injection (ECCI) system at a Canadian nuclear reactor on the shore of Lake Ontario to activate for the first time in the province's 23-year history of CANDU reactor operations.

This last-resort emergency, injected cooling water to avert core damage and possible meltdown at Ontario Hydro's Pickering Nuclear Generating Station, located 20 miles east of Toronto. The accident raises the question of whether unknown design flaws exist in the Canadian design CANDU reactor, and the possibility that nuclear safety margins are decreasing as the reactors age, increasing the risk of a major accident.

The unprecedented accident and the resulting heavy water spill at one of the facility's eight nuclear reactors also involved an off-site radiation release. Regulatory concerns about the accident and public concerns over nuclear safety at Pickering have delayed the relicensing of the antiquated station by Canada's Atomic Energy Control Board (AECB).

Pickering town councillor, Maurice Brenner is reported to believe that Ontario Hydro failed to provide "open and honest communications" with the town concerning the accident. The *Tbronto Star* newspaper is asking whether the accident caused damage to the reactor's nuclear fuel.

The accident at the 500 MW unit 2 started when a fault caused a pressure relief valve on the primary heat transport system to open, There are four pressure relief valves in the heat-transport system and they are designed as a "fail-safe" mechanism. They are supposed to pop open whenever the pressure in the reactor—either from excessive heat or from high volumes of water — builds up. Once the valves are open, the heavy water flows into the bleed condenser tank, where it is collected and later recycled. However, the pressure valve malfunctioned when an air line that keeps the valves closed failed.

As the water rose in the bleed condenser tank, the pressure dropped in the heat-transport system and tripped a sensor that stopped the turbines. When the turbines stopped **running, the system backed up. Pressure increased in the heat-transport system, a situation that the plants fail-safe mechanisms are designed to handle.**

However, in this case, a pipe in the bleed condenser broke dumping 130 tonnes of tritium-contaminated heavy water to the boiler room floor. This accident sequence is similar to that which caused the Three Mile Island accident, where a preesuriser performs similar functions to the bleed condenser, normally maintaining the balance and pressure of

A Pragmatic Perspective

"Area residents acknowledged that it was frightening to live so close to a nuclear reactor, but maintained a pragmatic perspective:

'If there's going to be a major nuclear disaster, we'd prefer to be close by and wiped out immediately rather than suffering and dying three days later from radiation sickness," said Sally Charbonneau, a mother of two who lives less than two kilometers from the reactor.

From the Toronto Globe and Mail

water in the primary heat transport system.

The ECCI system then automatically activated, dumping cold water into the heat transport system. For four and one half hours it kept the reactor fuel from overheating and the reactor from a severe core damage accident Six employees were operating the plant at the time of the leak. They were not moved out Another 100 were at the plant, but not in the area of the leak.

Pickering director Pierre Charleboifl said the incident "demonstrated the integrity of the safety systems and the ability of the staff to respond."

However, the community watchdog group, Durham Nuclear Awareness, which has the support of Toronto City Council, municipalities in the Pickering area, and several members of the Canadian parliament, urged the AECB to order a full investigation into safety at Pickering. The loss of coolant accident should serve to emphasise ongoing problems that would benefit from a public review by the AECB."

Durham Nuclear Awareness wants Hydro's nuclear power plants mothballed, and says it has new evidence that Pickering sits in an area that is threatened by earthquakes.

Norm Rubin of the Toronto-based public interest group Energy Probe says The accident developed in a way that compromised the vaunted 'defence in depth'principle of nuclear safety, because one fault led to another." He points out that the reactor shutdown systems of the first four Pickering reactors (Pickering A, one of which experienced the accident, are the least capable of Hydro's reactors. Also the Emergency Core Cooling Injection system was not part of the original reactor design, and was retrofitted.

The Pickering nuclear accident occurred while Ontario Hydro and federal GANDU seller, Atomic Energy of Canada Ltd. are promoting a plan for the US Department of Energy to fuel CANDU reactors at the Bruce nuclear power complex (north-west of Toronto on the shore of Lake Huron) with pluioniuro freed from the US atomic arsenal mixed with the reactor's natural uranium fuel. The proposal is deplored by Canadian environmentalists as unsafe and unsound, would leave the country with increased nuclear waste, and blur the line between civilian and military use of nuclear materials. Additionally, the Bruce reactors are already facing premature shutdowns for technical and economic reasons, with the first reactor of eight at the Bruce complex slated for permanent shutdown in 1996.

Based on reports by David Bright & Stephen Salaff for industry publications and by Ameer Nasrulla for the Toronto Glob and Mail*

Editor's Note: The accident at Pickering is of special relevance to us in India since the much touted "Pressurised Heavy Water Reactors of our own design" are in reality copies of Canadian reactors. The Rawatbhata and Madras reactors are based on the Douglas Point reactor (which was a precursor to Pickering) whereas the later reactors at Narora, Kakrapar and Kaiga are "improvements" on that design. There are very serious implications of the accident at Pickering for us. On a world-wide scale CANDU reactors are few in number and there is comparatively less operating experience. Thus, their safety features are not that well understood and they are quite capable of springing unpleasant surprises.

As the reactor population ages, it is more prone to have accidents. Old reactors in India like the one at Rawatbhata have not been retrofitted to have newer safety systems like ECCI as was done at Pickering. Thus, a similar sequence of events at Rawatbhata could have led to a bigger disaster. While newer reactors like Kakrapar-1 do have an ECCI system, it has not been properly tested, so its behaviour in actual accident conditions is a matter of conjecture and prayer. Editor's Note: The accident at Pickering is of special relevance

Poor Taste and Poorer History

The US Postal Service has announced a commemorative stamp marking the atomic bombings of Hiroshima and Nagasaki

The stamp, which marks the 60-year anniversary of the ending of World War II, shows a mushroom cloud and carries the caption, "Atomic bombs hasten war end."

Besides being in poor taste, the stamp is also poor history. Nearly 60 years ago, the "Big WAR" ended with the "Big Lie"; that the bombings were necessary to force Japan's surrender, thereby avoiding a bloody, costly invasion.

While the US government kept the record about the decision to bomb secret for decades, enough material is now declassified to debunk the "Big Lie."

The Japanese communications code was cracked early in the war. So when Japan was seeking Soviet diplomatic help in securing acceptable terms of surrender in June and July 1945, the United States knew it.

President Truman's journal, discovered in 1979, reveals his knowledge of Emperor Hirohito's early peace overtures through the Soviets. Towards the end, moreover, Japan's desperate state forced her to make peace overtures directly to the United States.

Japan's desperation was partly the result of a massive US fire-bombing campaign aimed at her cities. The naval and aerial blockades of the island nation were tight; food was short and raw materials were scarce. Bombing, blockade and an unsuccessful Japanese attempt at industrial dispersion had significantly reduced their production capacity.

The official US Strategic Bombing Survey reported, "Based on a detailed investigation... and supported by the testimony of the surviving Japanese leaders involved, it is the Survey's opinion that certainly prior to 31 December 1945, and in all probability prior to 1 November 1945, Japan would have surrendered even if the atomic bombs had not been dropped..."

The official explanations that the bombings were needed to save American lives also contradict a secret study conducted by the War Department's Operation Division in early 1946. Discovered in the National Archives in 1989, the study plainly stated that a full-scale invasion was no longer necessary by the summer of 1945 and that it would have never occurred in any event. While these reports were written with hindsight, the authors of the first report stressed to Truman in June that an invasion was not needed. The met is, the President had accurate foresight aplenty.

We now know that he received similar advise from nearly all his top military advisors, including Gen. Hap Arnold and Gen. Curtis LeMay, certainly no dove. Eisenhower told Secretary of War Stimson, "Japan was already defeated and that dropping the bomb was absolutely unnecessary." According to Gen. Omar Bradely, Eisenhower also conveyed this to Truman in a June 20 meeting, challenging the President on his stated intention to use the new weapon.

The primary reason for the bombings appears to have been the desire of Truman and his advisors to keep the Soviet Union out of the Pacific war, thereby solidifying US economic and political control in postwar Japan and Asia. As the President somewhat crassly put it, the bomb "would keep the Russians straight."

Truman postponed the Potsdam conference until July 17 so it would occur after the secret July 16 atomic test. At Potsdam, with his atomic card concealed, Truman got the Soviets to amend the agreement reached at Yalta in February. At Yalta, the Soviets agreed to enter the war with Japan three months after the surrender of Germany, which came on May 8. All agreed that the Soviets would declare war on Japan on August 8,1945. Until mid-April, the United States felt that it needed the Soviet entry to break the Japanese military. But Japan's deterioration had come so quickly the Soviet Union was no longer needed. At Potsdam, Truman got the date for the Soviet declarations of war set back a week to Aug. 15, giving him time to push the new bombs into production and delivery. Hiroshima was bombed on Aug. 6, Nagasaki on Aug. 9. As Winston Churchill observed at Potsdam on July 23, It is quite clear that the United States do not at the present time desire Russian participation in the war against Japan." A primary architect of US policy, Secretary of State James Byrnes, said he was Anxious to get the Japanese affair over with before the Russians got in." His diary reveals he was doping for time, believing that after (the) atomic bomb Japan will surrender and Russia will not get in so much on the kill, thereby being able to press claims against China."

The only nation to use atomic weaponry in warfare has a peculiar responsibility as the 50th anniversary year of the bombings approach. Many Americans are already repeating, perhaps unknowingly, the old lie that without the bombings more American and Japanese lives would have been lost than the 200,000 Japanese killed in the ongoing tallies of the bombings.

But the historical record clearly shows - for those Americans patriotic enough to embrace it - that not even these Japanese's deaths were necessary. As the people of the old Soviet Block have shown us in recent years, confronting national falsehoods is never easy. Still we must do it. Our commemorations ought to be solemn, sensitive and above all truthful. We owe the Vaporised dead, some of whose shadows are burnt into the concrete of Hiroshima, nothing less.

Patrick G. *Coy*
The Post Standard, December 7,1994.

Later news-reports said that the proposal to issue the stamp had been dropped because of strong public opposition—Editor

Seminar on Nuclear Energy and Public Safety

On February 3 and 4,1995, Indian National Trust for Art and Cultural Heritage (INTACH) organised at the India International Centre in Delhi a seminar on "Nuclear Energy and Public Safety" in its series on 'Science and Public Policy." Originally, high officials of the nuclear establishment had agreed to attend the seminar, but at the last moment thought discretion to be the better part of valour. However, representatives from the Atomic Energy Regulatory Board were present as were two nominees from the Department of Atomic Energy (DAE). Also present were Dr. M. R. Srinivasan, the erstwhile chairman of DAE, and Mr. S. K. Chatterjee, the recently retired Managing Director of the Nuclear Power Corporation. A serious lacunae of the seminar was the scarcity of 'neutral' observers. The seminar thus became more a harangue of the converted to the unconvertibles. Despite this inherent limitation, the seminar did manage to reach a consensus on the following points, and thus serve a useful purpose. The person most responsible for guiding this disparate group of individuals towards a conclusion was Dr. Vinod Gaur.

Resolutions and Recommendations

Discussions and presentations made at the seminar clearly showed that a divergence of perceptions and understanding of some of the crucial public safety issues of nuclear power, clearly exists between scientists of BARC and the AERB on the one hand and other independent scientists working in the public domain, on the other. These differences could be substantially bridged, if appropriate steps are taken to ensure transparency of related information systems and the scientific vigour of the investigations made and their analysis. In order to bridge these gape with genuine understanding necessary to evoke a constructive criticism and public response, the seminar accordingly makes the following recommendations and earnestly appeals to the Government to implement these forthwith.

1. That in the interest of instilling public confidence in all matters relating to public safety issues of nuclear energy, the Government should restructure the Atomic Energy Regulatory Board (AERB) as a truly independent agency outside the control of the Atomic Energy Commission. Further, the restructured AERB be appropriately furnished with requisite technical facilities, expertise and resources to enable it to fulfil its mandate to the nation.

2. That the Government should also initiate necessary steps to develop expertise in nuclear engineering in higher technological institutes.

3. That the Government may take appropriate steps forthwith to introduce a consultative mechanism through open public hearing at all crucial stages of setting up and operating nuclear installations.

4. That the Government may promote joint discussion meetinp, between officers of the Atomic Energy Establishments and the public and voluntary organisations to provide a forum for promoting mutual understanding of the diverse aspects of complex safety related issues.

5. That in the interest of promoting accountability and constructive public response, the AEC and AERB should hence forth make publicly available all data and information relating to safety, in particular, the technical report of Site Investigations, Environmental Impact Assessment, Safety Analysis, Emergency Preparedness Plans, Compilation of Operational Data, Analysis of Unusual Occurrences and Accident Analysis Reports.

   Further the report of Investigations of the Kaiga dome failure, ordered by the AERB, be released for public information.

6. That in the interest of allaying public fears of the long-term hazards associated with the decommissioning and retrofitting of ageing and impaired nuclear power plants and of waste disposal, the Government should bring out detailed scientific documents giving information on the scientific approaches and plans of inspection and repairs of the ageing Tarapur plants, re-tubing of the impaired Rajas than Plants, as well as long-term disposal of radioactive wastes.

7. That the AERB should seriously consider involving NGOs in the scientifically designed investigations of important issues of public safety as well as in the important task of creating an informed opinion amongst communities living in the neighbourhood of nuclear installations,

8. The Atomic Energy Regulatory Board and the AEC should make effective use of technological expertise and advice available abroad for timely resolution of safety-related issues, in addition to relying upon those available in the country.

Subscription Information

Rs. 30/-per year (6 issues) within India
U.S. $ 15/-per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0631) For cheques and drafts drawn on other banks, please add Rs 10/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampooraa Kranti Vidyalaya
Vedchhi, 394 641 India
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Published by S Gadekar for Sammpoorna Kranti Vidyslaya end printed at The Parijat Printry, Ahmedebad

PRINTED BOOK

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 8 Number 5 April / May 1995

The Highest Duty

l do not ask for mercy. I do not plead any extenuating act. lam here, therefore, to invite and cheerfully submittothe highest penalty that can be inflicted upon me for what in law is a deliberate crime, and what appears to me to be the highest duty of a citizen.

Mohandas K Gandhi (Statement in the Great Trial of 1922)

Your Honour, the Douglas County Jail is not a comfortable place to be .... especially for someone of my age and disability. I am 68 years old and blind. 1 can no longer read books or magazines, or newspapers or even the mail that comes to me from friends and family. I can no longer play the chess games and card games that help to while away the days and weeks and months in jail.

But I did not come to Omaha to seek comfort. I did not come to Offutt Air Force Base and to jail in search of relief from pain and suffering that is largely of my making. And I have not come to this courtroom today to negotiate a return to the comforts of home.

I came to make a point I came here to say with my body what I have been saying with words for almost half a century. I came here to alert this courtroom to our government's preparations for waging nuclear war.

I could have gone to any district in the United States to make the point. Sadly, our government's design, manufacture, testing, transportation, deployment, command and control of nuclear weapons permeates every part of our land. But I chose to come here because Offut Air Force Base is headquarters of the US .Strategic Nuclear Command, which controls the targeting and launching of many thousands of nuclear warheads, some more than 100 times more powerful than the bomb that destroyed Hiroshima. And I chose to come here now because, contrary to public opinion and despite the end of the cold war, our government has not relinquished one iota of its capacity for waging nuclear war. and it has no intention of doing so.

Under international law it is a crime to point weapons of mass destruction at defenceless cities. Under international law, it is the duty of every citizen to do everything possible to prevent such crimes. Many international laws are also the law of our land, having been ratified as treaties by the Senate of the United States. I have done my best to uphold the law. Now it is the responsibility of this court.

Your honour, you have seen the evidence in this case and rendered your verdict of guilty. So be it If this is the time for me to express regret and beg for mercy, I do so readily.

I regret that I did not succeed in penetrating the legal thicket of this case to apprise the court sufficiendy of the clear and present danger in this district I regret that, like the good judges who looked the other way in Nazi Germany while Hitler was preparing his holocaust, you could not bring yourself to take appropriate action while there is still time, I regret that you did not seize this opportunity to declare StratCom a global public nuisance, a threat to the world, a crime against humanity.

I beg for mercy - not for myself, but for the many millions who may some day perish under the mushroom clouds of nuclear weapons launched, in effect, from this very district I pray for mercy for the children, the old and the sick, the disadvantaged and the disabled who suffer daily , even in the absence of nuclear war, because public funds that should be spent for them, rather than siphoned into the coffers of corporations and military services that profit from preparations for nuclear war. And I beg for mercy for the earth, suffocating and dying bit by bit under its mounting burden of permanent, deadly, radioactive poison.

Finally, Your Honour, I beg you to reconsider your verdict. Not for my sake, but for the sake of all I have mentioned. If you cannot do this, then I welcome whatever prison term you propose. Please know that as a matter of conscience , I cannot accept any probation that would keep me away from Offutt, or any other military or nuclear installation. On the other hand, if you find that you cannot in good conscience enforce a law that exonerates StratCom while criminalizing me, I invite you to come down from your bench and join me and my friends at the gates of Offutt Air Force Base. We need your help. Thank you.

Sam Day from The Inside Word

From *the Editor's Desk*

Nuclear Non-Proliferation Treaty (NPT) has been in the news lately. We have previously stated the Anumukti's position on this treaty in clear terms. We remain unambiguously opposed to India or anybody else for that matter, signing this treaty since we feel that no self-respecting person or nation can sign the treaty. The treaty seeks to perpetuate injustice in international relations and rewards those who have wilfully harmed their own unsuspecting citizens besides all other beings. The nuclear haves have no intention even now of foregoing the power acquired through possession of these weapons and are in fact in the process of 'refining' these and other newer tools of death. Even the blood money that these nations are prepared to pay to other nations for observing nuclear celibacy is paid *in* the false coin of 'peaceful nuclear technology'. A bad bargain for all concerned.

However, our opposition to the NPT does not in any way imply support for those in India who want to ape the wicked and make the bomb. In this issue we have a number of articles from Sam Day—a previous editor of Bulletin of Atomic Scientists who continues to oppose his country's nuclear madness not only through words but by laying his body on the line. Some day I hope I shall have the same courage.

Survey cit *Kakrapar:* Volunteers Needed

From May 20th onwards, we intend to do a health survey of people living in the vicinity of Kakrapar Atomic Power Station. The plant has been in operation for just two years. A team from South Gujarat University at Surat had done a base-line health survey of the population. This survey had been funded by the Department of Atomic Energy and has received a lot of co-operation from the nuclear authorities. The findings of the survey have yet not been published. There is a rumour that an interim report has been submitted to nuclear authorities, but the public has no access to it

We strongly feel that information regarding their own health and surroundings is the public's right. The main purpose of our survey would be to restore this right to people around Kakrapar. We intend to publish pur findings as soon as the analysis is over, hopefully before the end of this year.

A training camp for volunteers would be held in Vedchhi from May 20 to May 23, following which everyone would proceed to do the survey. Amongst the volunteers, an ability to speak in Gujarati or Choudhry or Gamit would be a great asset, although we also need people who can help with computer data entry.

Wrong Turns At Every Crossroad

NPT: A Northern Antinuclear Perspective

In the half century since a bomb of unimaginable fury ushered in the atomic age, three events stand out as pivotal in the long and losing struggle to prevent the scourge of nuclear war by somehow stuffing the genie back into the bottle.

In 1948, an effort to put atomic energy under international control, taking it out of the sovereign states, foundered on superpower rivalry. The US refused to relinquish its sole possession of nuclear weapons and the Soviet Union was determined to break that monopoly.

In 1963, forced to deal with a worldwide uproar over radioactive fallout from nuclear weapons testing, the nuclear governments of that time, (the US, the USSR and Britain) preserved their testing capability by agreeing to limit it to deep holes under the ground. The result was that field testing of new warheads, one of the keys to nuclear weapons development, continued unabated and the arsenals grew enormously.

In 1970, when advances in nuclear technology threatened to spread nuclear weapons throughout the industrialised world, the five nuclear weapons powers sought to stem the tide by negotiating the United Nations Non-Proliferation Treaty. The NPT bought off the "have not" states, by offering them nuclear power technology in exchange for. their pledge not to produce nuclear weapons. In turn, the "have" states promised to cut back their arsenals, leading to nuclear disarmament. Yet, despite surface appearances, the nuclear arms culture continued to flourish.

In each of these instances, human aspirations for freedom from the fear of nuclear destruction were systematically and cynically thwarted by machinations of what has become a deeply entrenched nuclear-military-industrial establishment.

Today, as in the past, the nuclear lobby is at work outflanking, confusing, and even infiltrating the forces that still place their hope in a reasoned and non-violent end to the nuclear arms era. Sadly, these corrupting influences can be seen at work in the current efforts of the "arms control" community, in support of a Comprehensive Test Ban Treaty (CBT) and a strengthened Nuclear Non-Proliferation Treaty.

Late in January, in what appeared to be a move toward final termination of nuclear weapons testing, President Clinton announced that the US would no longer hold out for an "escape clause" in the CTB now being negotiated in Geneva by the major nuclear weapons states. Since US hesitance had come to be a key stumbling block in the negotiations, the apparent policy switch paved the way for the long sought CTB.

But, as in 1963, when the nuclear states agreed to banish testing from the oceans and the atmosphere, there is a loophole that would leave the nuclear establishment free to conduct business as usual. In 1963, the loophole left the nuclear weapons laboratories to test underground. In 1995, the loophole is the sanction to continue testing *in the laboratory.*

While arms control advocates have long pinned their hopes and put congressional muscle behind closing the underground loophole, the nuclear weapons elite have been preparing a fall-back position in their laboratories at Los Alamos, New Mexico, and Livermore, California. Their success in achieving this was confirmed last fall when the US Energy Department announced plans to build a $ 1.2 billion "National Ignition Facility" at the Livermore lab.

The function of the new facility would be to simulate the unique conditions (heat, pressure, and radiation) which are necessary for the testing of newly designed nuclear war-heads and their components which are necessary for the testing of newly designed nuclear warheads and their components. Its purpose and effect is to facilitate the continued forward thrust of nuclear weapons development without the need for new field explosions that are expensive, dirty, detectable and politically burdensome.

Continued reliance on the NPT as a way of shrinking nuclear arsenals and confirming their spread also is fatally flawed. This will become even more evident when the 170 signatory states gather on April 17, to consider whether Co extend, modify, or scrap the existing 25-year old agreement

Many NPT critics will be attempting in New York to pressure the nuclear weapons states into deeper cuts by agreeing to a limited extension of the treaty. But this would only defer the unresolved issues underlying the NPT:

If the signing of the CTB leaves the loop-hole of laboratory testing for technologically advanced nuclear "have" states, why should the new treaty be taken as evidence of their intent to give up their advantage? Surely, NPT should not be extended without a ban on the testing in the laboratory as well as in the field, and without international monitoring to ensure compliance.

What about the problem of clandestine nuclear weapons production by states that refuse to sign the NPT and thereby avoid the international inspection of their nuclear facilities? Notable amongst such rogue states are India and Pakistan and Israel. Surely, NPT should not be renewed without the provision of economic and diplomatic sanctions against NPT-1 non-signatories.

What about the wisdom of continuing to promote nuclear power in the Third World as an incentive for staying away from nuclear weapons production? Iraq and North Korea, both NPT signatories, have shown how international inspectors can be hoodwinked. The leading industrial states now pushing nuclear power on the Third World have already encountered the ruinous health, environmental, and economic effects. Surely, NPT should not be further extended without a fresh assessment of the global impact of nuclear power.

Not surprisingly, the nuclear establishment in the US, having infiltrated and seduced much of the liberal arms control community, is pushing hard for a Comprehensive Test Ban Treaty - excluding laboratory testing - and for renewal of the Non-Proliferation Treaty with no strings attached. They argue now, as they did before, that this is the most we can accomplish at this time.

For those who have learned to live with the bomb, and to depend on it and profit from it, 1995 promises a renewed lease on business as usual of the kind secured in 1948,1963 and 1970. For the rest of us it could bring still another lost opportunity to usher out the atomic age short of atomic war itself.

Sam Day, in Nukewatch

NPT, A SOUTHERN PERSPECTIVE

The NPT has not been much of a success either in promoting disarmament or in promoting nuclear non-proliferation. Even while the United States and Russia have made a modest beginning in reducing their nuclear arsenals, they continue to press for an indefinite continuation of the NPT. This would allow them to maintain nuclear weapon arsenals forever.

The three other nuclear power signatories to the NPT - France , Britain and China - remain free to upgrade and modernise their nuclear weapons. And despite being signatories to the NPT, Iraq and North Korea have managed to develop their own clandestine nuclear weapons programmes.

The non-nuclear nations view the NPT as an unequal and inadequate treaty. They are justified in thinking that an indefinite extension of the NPT means an indefinite postponement of universal nuclear disarmament. As it is, the five declared nuclear powers have no time frame within which they plan to eliminate their nuclear weapons arsenals. The US does not even support Geneva negotiations for a treaty to outlaw the first use of nuclear weapons against non-nuclear states, Russia has retreated from its 1978 no-first-use pledge. China still continues to test; and of the other four who have accepted a voluntary ban on testing, it is still not clear how long France will adhere to it. and there is pressure even in the US to continue with hydro-nuclear testing or laboratory level testing.

If the important long term goal of the NPT is universal nuclear disarmament, then it is difficult to see how the non-nuclear nations can be convinced that this goal can be achieved through an indefinite and unconditional extension of the NPT.

The treaty has no teeth. It does not place reasonable obligations on the declared nuclear powers to move towards disarmament. There is no time-frame in the treaty for disarmament, no markers for progress towards that goal and no censure, sanction or punishment for failure to disarm. It is any wonder then that Article VI of the treaty, its general link with the goal of disarmament, has become a major rallying point for the non-nuclear signatories to the treaty?

Because the NPT didn't aim towards universal nuclear disarmament in a meaningful way, it was not able to bring in nations which wanted to keep their nuclear options open - although it is quite possible that even if the NPT were an equal treaty, countries like India and Israel might still have kept out of it.

The NPT is a contradictory treaty in several respects - its objective is to prevent nuclear proliferation by the Haves while prohibiting horizontal proliferation the Have Nots; it actually promotes commercial nuclear technology and materials that can be used in weapons programme; and it justifies peaceful nuclear explosions whose benefits are yet to be demonstrated but whose disastrous environmental consequences are all too apparent. There are several other inadequacies in the arrangements associated with the treaty - inefficient safeguards, the unresolved confusion between civil and military weapon and dual-use potential of nuclear technology, no clear definition of a nuclear weapon,, the dual-role of the IAEA as both a promoter and controller of nuclear technology etc. These have been discussed endlessly by experts.

No doubt the various shortcomings of the NPT can be discussed in detail to counter the arguments of those who want to extend the treaty indefinitely in its present form. The political point, however, is that from which perspective and with which goal are these shortcomings being pointed out. Is the perspective one of meaningful progress towards disarmament and non-proliferation or of merely maintaining a moral high ground while simultaneously creating a space for maintaining a nuclear option. The question is one of tendency - which way is one moving while making the right noises?

The question may have been resolved in the case of South Africa, which has dismantled its nuclear weapons and joined the NPT. It is not of much significance in the case of Argentina and Brazil because they have taken definite steps in the direction of bilateral and regional agreements on disarmament. But it assumes a special significance in the case of the undeclared of de-facto nuclear notions outside the NPT - i.e. Israel, India and Pakistan. By saying that in the Middle East the NPT alone cannot prevent local wars, Israel is only defending its undeclared nuclear status. And when India criticises the NPT as not promoting global disarmament and being discriminatory , we know only too well that these are self-serving arguments for keeping the Indian nuclear weapon option open.

Defendants of nuclear weapons in the undeclared of de-facto nuclear states are using a number of devious arguments to justify not giving up their nuclear weapons capability. The use of the racial metaphor of maintaining a balance between the white and the non-white nuclear and nuclear capable powers, the argument for achieving self-reliance and strategic autonomy through proliferation and claiming that NPT cannot resolve regional conflicts are all part of the same bag of arguments.

Here is a sample of the racial argument from an Indian strategic analyst who sees a desirable balance emerging between the first four nuclear powers - the USA, the USSR (now Russia), Britain and France and the late entrants like China, Israel, India and Pakistan. He writes: "Today we have a situation where as against the four white nuclear weapon nations there are four non-white nuclear weapon/nuclear capable weapon nations, corresponding to four civilisations - the Sinic, the Jewish, the Hindu, the Islamic...Today there is a balance between four white and four non-white nuclear weapon/nuclear capable weapon nations. There is no reason why this balance should be disturbed in favour of the white nations by reducing the non-white representation."

The argument is not only racist it is also patently dishonest, there can be no disarmament by legitimising the nuclear proliferation of Israel, India, Pakistan or China.

Even the end of the Cold War is used by the defenders of nuclear weapons in India to argue for proliferation. It is suggested that the bipolar world through its system of alliances permitted an "external balancing" which obviated the need for developing nuclear weapons by several other countries. However, since this has become impossible with the collapse of the Soviet Union, they argue several middle ranking developing countries feel the need to acquire their own nuclear capability- a sort of "internal balancing" to maintain their strategic autonomy and independence.

Yet another argument is that since some nuclear proliferation has already taken place, why not shift the focus - from preventing nuclear proliferation to "managing" it Thus an Indian bomb analyst has suggested that a supplementary agreement to the NPT be signed to create what he calls "an Equal Opportunity NPT" which would help bring the nuclear hold-outs against the treaty into the regime, without undermining it. This, it is suggested, could be followed with an arrangement, prohibiting all further nuclear-weapon related activity world-wide, and which would ban all future manufacture of nuclear weapons, impose a comprehensive verification regime on all countries. The long and short of these arguments is that as long as nuclear weapons continue to be seen as a potent currency of power internationally, there would not only be proliferation, but also many arguments to rationalise their spread.

Clearly, the alternative to a discriminatory non-proliferation treaty would be genuine and complete nuclear disarmament through credible ways leading to the elimination of nuclear weapons. Disarmament can only be promoted by actually disarming and not by proliferating even if in a limited manner. The end of the Cold War has knocked out what ever basis there might have been for nuclear weapons. And although there is a long way to go towards a nuclear weapon free world, elimination now appears to be a realistic and necessary goal.

Within the overall context of the end of the Superpower rivalry, several factors have made it conducive today to push the agenda for elimination of nuclear weapons. The successful adoption of the Chemical Weapons Convention is one such factor. The inability of the declared nuclear powers to push through an indefinite extension of the NPT is another. The movement forward on a Comprehensive Test Ban Treaty and on fissile material cut-off is yet another factor that shows that the disarmament and non-proliferation agenda can be pushed on several complimentary, converging and mutually reinforcing tracks.

The crux of the matter is to unequivocally repudiate the security doctrines and policies which justify the development, possession and use of nuclear weapons, and to make a commitment to the objective of eliminating nuclear weapons. Once this is done, several approaches are possible to meet this objective.

One such approach in *the* West Asian and South Asian contexts is that of proposing the setting up of Nuclear Free Zones. Such zones are good transitional mechanisms to global disarmament. At the same time they represent a principled and yet realistic framework for nuclear restraint in a region.

The proponents of nuclear weapon free zones argue that there is a powerful political case for nuclear weapon free zones because they address the issue of security without sacrificing national sovereignty of legitimising the possession of nuclear weapons by a handful of states. While they are a potent contribution to nuclear disarmament, they do not at the same time negate a larger global effort

It is difficult to see how the path to nuclear restraint and disarmament either in West Asia or South Asia can go via the NPT. Any restraint must not single out some governments for disarmament while the declared NWS (and Israel) continue to possess nuclear arsenals. Thus, for example, in mid-February, in Cairo, the Arab league members - to "make the Middle East a zone free from atomic, biological and chemical weapons." The draft is to be presented, according to news reports, to the Arab League foreign ministers for ratification in March in Cairo.

The idea of a Nuclear Weapons Free Zone has been mooted in the South Asian context too - by Pakistan and by peace activists even in India.

Analysing India's options for example, one such activist has argued that in the absence of a coherent nuclear doctrine, India's nuclear choices are painfully limited. The choice of closing the nuclear weapons option seems politically unfeasible given the hype and jingoism over Pakistan's nuclear capability. Implementing the nuclear option and announcing that India has nuclear arsenal could be even more problematic as it would elicit a similar response from Pakistan and at the same time provoke China into a nuclear-adversarial relationship which would result in an unequal nuclear arms race.

But the option for India - engaging Pakistan in a bilateral dialogue to establish a nuclear weapons free zone in South Asia - actually provides a workable alternative to the discriminatory nuclear non-proliferation treaty while supporting genuine disarmament.

To quote, once again, an advocate of the South Asian Nuclear Weapons Free Zone: "As transitional steps, the two governments should agree not to deploy missiles, to freeze fissile material production, and not to test or use their nuclear weapon capabilities, as well as take confidence building measures. This will lay down the ground for involving other South Asian states and the nuclear powers in negotiating a Nuclear Weapons Free Zone agreement - prevent the manufacture or deployment of nuclear weapons in the region, the targeting of such weapons at it, or their transportation through it."

However given the existence of weak governments in both India and Pakistan at the present juncture, such a regional initiative is not possible without global measures towards nuclear disarmament. Perhaps this is true even of West Asia.

Some Nuclear Weapon States such as the US have tried to push through the Nuclear Weapon Free Zone idea in South Asia. But they are bereft of any moral legitimacy in arguing for such an initiative unless they themselves are seen to make proportional nuclear disarmament commitments.

Thus peace activists in South Asia, for example, have been arguing that global agreements such as CTBT, no first use and fissile production cut-off are a pre-condition far a South Asian Nuclear Weapon Free Zone initiative. They are necessary pre-conditions but not sufficient. The argument is that to be effective in breaking the South Asian Impasse , CTBT, no first use and fissile material production cut-off must be followed by (a) deep cuts in strategic nuclear weapons of the five Nuclear Weapon States; (b) an universalisation of the INF Agreement; (c) a substantial reduction of strategic missiles; (d) quick elimination of battlefield tactical weapons; and (e) progress in verification agreements.

Needless to say that if the NPT is extended indefinitely this April it would become so much more difficult to take these major steps to eliminate the bulk of the world's nuclear arsenals.

Indeed , even strategic analysts in the nuclear weapon states realise that unless some genuine progress is seen to be made in this direction, the NPT cannot be extended unconditionally and indefinitely. At the last count the US needed 15 to 20 more votes than it now has out of the 169 signatories to the NPT to get it extended indefinitely by even a simple majority. The prospects of a decisive majority are little.

Writing in the New York Times on Feb. 15 1995, Selig Harrison, a fellow of the Carnegie Endowment for International Peace, suggested that: To rescue the non-proliferation treaty, the nuclear powers should take two immediate steps to demonstrate their recognition of their Article VI obligations. First, the US and Russia should begin negotiations on a Third Strategic Arms Reduction Treaty (START III) that would set a timetable for a gradual decrease of nuclear weapons below the level of 3,500 each negotiated by the Bush Administration in the START II agreement of 1991. The timetable should project progressive and balance reductions down to 600 nuclear weapons...Second, the START III dialogue should be accompanied b five-power negotiations on the 'treaty of nuclear security and stability' proposed by President Yeltsin in the UN in September . He envisioned 'further steps' to limit Russian and American strategic nuclear weapons, together with a cap on further increases in French, Chinese and British nuclear arms while the US - Russian build down progresses."

Then he suggests that getting down from the 660 to 0 would require a broadened dialogue embracing nuclear capable states such as India, Israel and Pakistan. And elimination, he says, will become a realistic possibility only if continuing progress is made in establishing secure safeguards against further proliferation. This certainly represents a way forward.

Only once the extension of the NPT is predicated on the specific movement forward on several complimentary, converging and mutually reinforcing nuclear disarmament tracks, does it make sense even to argue what kind of rolling extension of the treaty should be supported.

Bharat Bhushan, in WISE News Communique

Military Experiments

It has now been admitted by the US Department of Defence that in the dawn of the nuclear age it undertook deliberate radiation experiments with children, pregnant women, prisoners, mentally retarded persons and the terminally ill. This was done during the same time period in which the US and other victor nations prosecuted Germany for the same crimes against humanity.

These types of crimes and duplicity appear to be still practised by the US military, as recently as in the Gulf War. It also appears to be part of the military policy underlying the HAARP project now underway in Gakona, Alaska, with planned implementation in 1997. This High Frequency Active Auroal Research Project (HAARP) will heat the ionosphere using powerful beams of non-ionising radiation. Potentially this will set the Earth into vibrations or oscillations similar to the Earth's axis wobble. The joint US Army and Navy project involves interference with the Earth's magnetosphere with unknown effects at the opposite magnetic pole near Australia and New Zealand. Professor Richard Williams has denounced the experiment as "irresponsible and dangerous". Alaskan Federal Aviation Authority (FAA) personnel, pilots, communications engineers and others have raised alarms about HAARP'S interference with radio communication. They were overruled by the national FAA which approved the project proposing that the problems be "mitigated". On the other hand, the military claims the transmission interference problems are too great to allow for locating HAARP to close to any military facility. The capability of HAARP is greater than *the* total output of the more than half-a-million US ham radio operators using their maximum allowed power. Communication with isolated Arctic villages and bush pilots is often a life and death matter in the North.

The inventor of HAARP is Bernard Eastlund. He was hired by ARCO "to find a use for their Alaska Birth Slope gas deposits." Patents held by the ARCO subsidiary building HAARP describe an ionospheric heater capable of stopping missiles, changing weather and disrupting global communication. The HARP project appears to be an implementation of Easdund's patents.

The Military has made increasing use of non-ionising radio waves, like the polarised pulsing transmissions planned for HAARP, in recent years as an electronic "fence" at Greenham Common and other military bases. According to *Defense News* an electro-magnetic pulse (EMP) weapon designed to mimic the flash of electricity from a nuclear weapon was an example of technology used in Operation Desert Storm. The Gulf War has been described as an "electronic battleaeld" with 14,000 electronic detectors each sounding up to three times daily during the war. This electronic environment may well be one of the triggers which left more than 16,000 veterans with Gulf War Syndrome. The preponderance of current research shows that non-lonising radiation can promote cancer growth, cause disorientation and many other physical effects.

Certainly admitting to wrong doing in the past and making some attempt to compensate the victims is a step forward for the military. However, such action becomes hollow, dishonest and reprehensible if the gross violations of human rights continue under another guise.

Until the US ratifies the United Nations Human Rights Covenants and joins the international community of nations which recognise and uphold those rights, such purges of past mistakes will not be taken seriously. The right of all humans to life and health should be a constituent part of a genuine democracy. Experimenting with electronic zapping of the human body, disruptions of weather and wiping out of essential communication in the guise of national security constitutes a crime against humanity and perversion of both the Constitution of the United States and the Charter of the United Nations. It undermines the very notion of security.

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Dr. Rosalie Bertell

Letter Box

So Little For So Much

It has happened yet again. Every year the nuclear establishment manages to (mis) appropriate the lion's share of government funding for science and technology. One would have thought that in the post liberalisation, market driven economy the criteria of efficiency and minimum level of performance would be applied to nuclear industry as well. But no such luck. The gross distortions in our science policy which have favoured atomic energy projects, persist even today. A quick look at this year's budget allocations tell its own story.

Nucleocrats have managed to allocate themselves more money than the entire budgets of the Department of Science and Technology, the vast network of 29 CSIR Laboratories, bio-technology, and the Department of Non-conventional Energy Sources, combined! Of the energy budget, 85% goes to "develop" nuclear technology and all the so called non conventional energy sources are allocated the remaining crumbs.

Comparison of the atomic energy budget with the budget for priority sectors like primary education is equally revealing. Despite all the crocodile tears of the finance minister about the crucial importance of elementary education, the total allocation for primary education (Rs 651 crores) and secondary education (Rs 670 crores) is still less than the nuclear largesse.

Regular readers of Anumukti need not be told about the "achievements" of DAE despite the thousands of crores that have been pumped into it for decades. What is alarming is the feet that today, DAE is not in a position to make even false promises. It has already admitted that the uranium reserves in the country are sufficient only for about 10,000 MW of installed capacity. The Indian breeder development programme has been a disaster, like all the other such programmes in the world. The cost of developing any revolutionary reactor technology is mercifully ruled out. The writing on the wall is becoming more and more visible. Atomic energy has nothing to offer. So what is the money going into7

Budget Allocations

Department	Budget in Rs (Crores)
Science and Technology	**418.85**
CSIR Laboratories	**411.03**
Bio-Technology	**96.52**
Non-Conventional Energy Sources	**248.38**
Atomic Energy	1402.15

It would have been gratifying if the answer had been "for research into decommissioning and waste management aspects." Moral responsibility is not a word to be found in nay nuclear glossary, but the nucleocrats owe the society at least some effort towards cleaning up the mess that they have created in the last four decades.

Sanjay Havanur

Against **Toxic** *Dumping in Mysore*

I am receiving my copies of *Anumukti* regularly and enjoying every one of them. The recently introduced *AERB Column* is, in my opinion, something of a victory for our movement I hope that people within the nuclear establishment get to read *Anumukti* and especially the AERB *Column.*

You are probably aware that the Karnataka Raitha Sangha is agitating against the dumping of toxic waste in the vicinity of three villages in the Chamaraja Taluka of Mysore District. The agitation is being led by Sri Mallesh, the secretary of the Sangha. I have written to him and to The Star of Mysore, a local English newspaper expressing my support. I feel that the toxic waste which is now proposed to be dumped cannot but include some waste from the uranium enrichment plant at Ratnahalli which is just 4 kilometres outside Mysore.

Asha Vombatkere
New Delhi

Tragic Consequences of Ignoring Sakharov's Warnings

After the success of an extremely powerful test of a Hydrogen bomb in 1955, Andrei Sakharov began to worry about its biological effects. Animal studies conducted with his biologist colleagues indicated that the ingestion of strontium 90 would cause both immediate and delayed damage to the immune response, and he calculated that each atmospheric test with a 50 megaton yield could cause a million premature deaths world-wide.

In 1958, Nikita Khrushchev was eager to reach a testing moratorium with the Americans and permitted Sakharov to publish his concerns. And indeed, neither the United States nor the Soviet Union conducted any above-ground tests in 1959 and 1960, much to Sakharov's satisfaction. But in 1961, after a fruidess, heart-breaking meeting in Vienna between Khrushchev and newly elected President John F. Kennedy, Sakharov was devastated to learn that Khrushchev had ordered the testing of hydrogen bombs of nearly unlimited explosive power - equivalent to 25,000 Hiroshima bombs - powerful enough to accelerate the death of several millions , according to Sakharov's calculations. When Sakharov questioned Khrushchev at a meeting later that year, he was denounced as "politically naive" and was thereafter banished from the Soviet nuclear establishment.

There is now considerable evidence of the remarkable prescience of Sakharov's predictions and the tragic consequences of ignoring is warnings. For example, in 1992 the Canadian physician R. K. Whyte demonstrated in the *British Medical Journal* that atmospheric fallout caused extraordinary increases in neonatal mortality and stillbirths in the United States and Britain after 1950, thus validating Sakharov's fear that there would be immediate as well as delayed harm to those born during the bomb testing years.

But Sakharov also predicted that man-made radiation would accelerate the mutation of all micro-organisms, leading to the inference that baby boomers born after 1945 with weakened hormonal and immune systems would eventually encounter newly mutated and therefore more lethal strains of bacteria and viruses, sexually transmitted as in the case of AIDS . In a 1990 article in the *American Journal of Public* Health, the Atlanta Centres for Disease Control affirmed that, because of AIDS, the mortality rates of men in the 25 -44 age group has started to rise in the 1980s, for the first time ever . And we now know that the organisms responsible for many infectious diseases, including tuberculosis and those associated with the AIDS syndrome, are mutating so rapidly as to resist traditional antibiotics, creating an unprecedented public health crisis.

Finally, mortality data broken down by age and published annually in the United Nations Demographic Yearbook indicate that in the 1980s, the baby boomer's mortality rates deteriorated in all the major nuclear nations except Germany and Japan (cited in *International Journal of Health Services*, April 1994).

Meanwhile , in the 1980s, the mortality rates for 25-44 year olds - the most productive group in the labour force - continues to decline in Germany and Japan. Thus we are left with the ironic speculation that because those two countries lost World War II, they were precluded from exposing their progeny to emissions from the manufacture and testing of nuclear weapons, and may therefore be said to have won "World War III".

The lesson to be learnt from the history of the atom bomb is that both the Western world and the former Soviet Union have paid a great price for ignoring the warnings of such great scientists as Albert Einstein, Niels Bohr, Linus Pauling, and Andrei Sakharov.

Jay M *Gould in*
Bulletin of Atomic Scientists
January/February 1995

Letter from Eastern Europe

What do greenies and anti-nukes do with their holidays - or what they fondly imagine will be holidays? Generally it seems, we turn them into workadays, if not by coming to Vedchhi to write articles like this one, then by going to places like Eastern Europe and getting roped in (willingly I must admit), to fight with plans by the European Bank for Reconstruction and Development (EBRD), Slovensky Energeticky Podniky (SEP) the Slovak electricity producer, Electrieite de France (EDF), Seimens and Bayernwerke, to complete the construction to western standards of two Soviet-designed VVER nuclear plants in Slovakia. Two-three months solid work that ended with the Polish Ecological Club (Polski Klub Ecologiczny) and the author all over Polish TV and newspapers.

Wait! This is getting ahead of myself. It all started innocently enough, when my spouse Mishka (who is Polish by birth) and I toured Poland and Czechoslovakia for about two months in November/December' 1994. It seemed natural in the course of our other activities, to call in on various environment groups in Poland and Czechoslovakia. We spoke in our travels to activists in the Green Federation and the Green Foundation, and the Council for All beings and to Tomasz Terlecki in Polski Klub Ecologiczny in Cracow, the medieval city that is the cultural heart of Poland. Tomasz indicated that he might have something up his sleeve to work on in the shape of a nuclear reactor in Slovakia called Mochovce', and gave me a file of material relating to it. We then spent a week with Hnuti Duha, a radical grass- roots group in the city of Brno, in Czechoslovakia - also an interest'ing medieval place, but quite different from Cracow. Hnuti Duha just happened to have extensive files on the safety of Russian-design nuclear power plants, which naturally, I raided, since Mochovce was a Russian-designed plant.

Hnuti Duha is strongly involved in opposition to the Temelin nuclear power plant, as well as with the already operating Dukovany nuclear plant, which just happens to be the same kind of plant as the Mochovce plant: a Soviet-designed WER213/440. Temelin is a Soviet-designed WER-320/1000 plant, which is due to be completed by another western consortium of which the main player is Westinghouse. As well as its nuclear concerns, Hnuti Duha is also very much concerned with uranium mining and waste issues, energy, and animal rights.

Uranium Mines:
The Spearhead of the Assault

Nuclear power plants run on uranium, and while we were with Hnuti Duha, they took us to see the uranium mine that supplies the Dukovany nuclear plant with fuel. Dukovany has a contract with a local Czech firm named Diamo for its 56t/y consumption. Diamo operates a very costly and messy mine at a place called Rojna, 40 km Southwest of Brno, and a meeting was set up for us to talk to local people.

The locals showed us a monster tailings dam containing 1.1 million tonnes of tailings and 17 million tonnes of 'sludge'. They showed us a smaller tailings dam in what used to be a pretty valley consisting of sludge and piles of waste (including we were told, cyanide waste) that reflected the setting autumn sun in interesting shades of toxic green.

Later, they took us to a local meeting hall, not 300m from the big tailings dam, where they entertained us with limitless home-cooked food and Czech beer (brewed since 1326) and with tales of the mining company and their so-far fruitless struggle to get rid of it. The contrasts and the similarities with our situation in Australia were startling: Rojna was a smaller, yet a much dirtier operation than anything I had come across in Australia. Maybe it resembles mines in India. These people lived, not 500 or 100 km away from it as they do in Australia, but 200-300m away from it. The dust from the dried tailings sludge dusted their crops, their animals, their children, and them.

Radon measurements were not even taken by the company because it was said that measurements done at another mining centre were 'enough'. Soil sampling had turned up thorium - a decay product of uranium. The mining company said it had 'come down in the rain'. Thorium is not a component of fallout either from Chernobyl or from testing, so there is no way it can have come down in the rain. Cattle deaths had increased fourfold in the 1990s, and illnesses amongst schoolchildren had risen by 100% in one year.

What upset people most however, was the attitude of the company and the authorities. According to the leader of the local agricultural department, I'm not drinking milk, so I don't care'. The mining company simply maintained that the concerns of local residents were being stirred up by nasty environmental activists like Hnuti Duha.

> *Now that the place is already spoilt, we might as well use it for a dump*

Indeed, while the company maintained on the one hand that there were no problems from its operations, it argued on the other hand that the area had already been 'spoiled' and should be used as a kind of 'national sacrifice area' for the disposal of various toxic wastes, an unappetising prospect for the locals.

As we took the train from Brno to Rojna, we observed dense forests, narrow valleys, a covered medieval bridge, a castle on a crag, and ancient churches and villages. Just the place, the folks from Hnuti Duha

Cold us, for a nuclear waste dump for the Dukovany reactors. The villagers had told us that they were indeed, a 'candidate site' for a national nuclear waste dump. After ah, they had mine tailings and toxic waste, so why not a nuclear waste dump?

A major theme for every Eastern European environment group is energy. This picture is completed by the major nuclear concerns in the Czech Republic and Slovakia - concerns which, if Mochovce and Temclin successfully reach completion, may ripple out to affect unfinished nuclear plants in Poland also. Also critical to the Eastern European energy picture are the activities of the multilateral development banks such as EBRD, Eximbank, and the World Bank, and programs such as Phare and Tacis.

The Worst of Both Worlds

While these agencies arc supposedly funding 'sustainable' and 'least-cost' energy strategies, they are in fact heavily involved in promoting projects which are imposing the worst aspects of Western development, while retaining the worst aspects *o{* the old Communist structures. Meanwhile, those things that the Communist regimes got more- or-less right (such as the heavy emphasis on rail transport and on cheap public transport in general) are dismantled or downgraded.

Current government policies in Poland and the Czoch Republic reinforce this trend. The Czech government for example, now considers the excellent train and tram system that it has inherited from the Communists, a system that would be the envy of supposedly advanced Australia, and which compares favourably with the German one with fares at about l/5th the price,to be 'superfluous', it explicitly intends to run down the rail system in favour of massive investments in roads funded by multilateral development agencies whose charters include commitments to 'sustainable development'.

Meanwhile, the Temelin nuclear power plant, consisting of 2-lOOOMwe VVER-320 plants which was being built with Russian help up to 1990, is to be completed with money from Eximbank and the help of Westinghouse. Never mind the fact that in 1990, Western governments were saying that Russian-designed nuclear plants in Eastern Europe were/are accidents waiting to happen, and that the only sensible thing to do was to close them down. Never mind the fact that Austria, whose own historic capital, Vienna, is not so far over the border, and who sensibly abandoned nuclear power in 1978, is strorgly apposed to the completion of Teme in. Never mind the fact that the local population are utterly opposed to it, and that civil disobedience actiors (coordinated by Hnuti Duha) have already taken place, and that the previous Prime Minister of the Czech Republic has declared his opposition to it. Never mind the $USi-2 billion cost of trying to complete the plant to 'western' standards. This is one Communist inheritance that the powers-that-be think must be preserved and built on at all costs.

A similar situation holds in Slovakia, whose Mochovce nuclear plant has become a major European issue, with the Austrian government and a network of environment groups in Austria, Germany, the UK, Slovakia, Poland, Hungary, and the US opposing the project.

Mochovce is an earlier (and hence, according to the Western nuclear industry in 1989-1990-91, a more dangerous) VVER440/213 plant. Construction on Mochovce 1&2 was suspended in 1990 due to lack of money, and the EBRD and EDF/Bayemwerke/Seimens have offered to complete it to 'western' safety standards.

The EBRD has at least, due to its own guidelines for project assessment, been forced to insist that the project sponsors, SEP and EDF, issue a complete environmental impact statement, least - cost analysis, and safety documentation. It was this that I was asked by Polski Klub Ecologiczny to critique.

Meanwhile, back in cultured and medieval Cracow, where baroque and Gothic churches front onto narrow, supposedly car - free streets full of bookshops and cafes where the dissidents used to hang out, and where every third person seems to be wearing a clerical garb of some kind, a few activists also struggle with green issues.

Cracow itself was presented in the 1950s by the Communists with a vast steelworks at Nowa Huta, in an attempt to proletarianise the place. The attempt failed spectacularly in the 1970s as the steel plant became a hotbed *of* strike activity and massive demonstrations round the only church permitted in the area, demonstrations that succeeded in toppling the regime. But the steelworks has created a permanent greyish brown pall over the city.

Automobile is King

Meanwhile, now that Communism has gone, the push is on to give more and more space to the private car which apart from the steelworks has become the main source of pollution and of course, to downgrade the once excellent tram and bus systems. Cracow is lucky in that it docs have a strong bicycle lobby and it and the green federation arc engaged in an effort to rid the old city of cars, and make it an area for cycles and pedestrians,. An attempt has already been made to rid the medieval city of cars, but implementation is less than wholehearted. Cars still manage to clog the footpath next to the 11th century church of St Anne and the 16th century church of St Peter and Paul and the University Library.

Dhanbad of Europe

Not-so-sunny and not so medieval, polluted, grubby heavily industrial Katowice and Chorzow, where Mishka was bought up are not so far from Cracow, though ail-too -radical surgery has been done to the timings of the trains that used to make the trip between the two cities so easy. Katowice represents much of what is problematic in today's. Poland.

Katowice became an area of mines and factories as long ago as the 17th century, and developed after the partition of Poland under the Austrians and the Prussians and then under prewar and Communist Poland into a major industrial area that produced 10% of the worlds black coal, and much of the global output of greenhouse gases. It is a vast conglomeration of genteely decaying 19th century apartments whose facades turn an interesting shade of dark green/black because of the pollution, of vast monolithic Communist- era apartment blocks, gigantic and decrepit mines and steelworks, railways, and elephantine piping.

Katowice has been described as 'the most polluted place in Europe'. I do not know that this is any longer true: The sheer volume of what used to be the dominant form of pollution, industrial pollution, has been slashed by the massive closure of many enterprises, as well as the fitting of some pollution control equipment. To the naked eye at least, Ostrava in the Czech Republic resents a more appalling vista, with vast clouds of smoke and steam belching from an old steelworks. And India certainly has much more diabolical industrial landscapes (for example around Dhanbad) as well as more choking auto -pollution, especially in Delhi.

But Katowice has massive soil and water pollution, and big problems with mine wastewater. And the public transport situation is much worse than in Cracow, where there is a pro-public transport lobby. As in Cracow, pollution from motor vehicles is fast becoming the major source of air pollution. Plans exist for massive superhighway construction round Katowice, which are held up only by the lack of money.

While the public transport services deteriorate further, fares are raised continually, and the regional government last year (1993) actually *apologised* for being unable to get *rid* of the trams - the mainstay of the public transport system - until sometime past the year 2000. The urgent need is of course, to upgrade and extend, rather than get rid of, what was once an excellent tram system. To keep things in perspective however, it must be said that the system in Katowice would have to deteriorate much further in order to reach the abysmal levels of public transport in Australian cities.

At a national level, this deterioration in public transport manifests in the continual cutting back of 'ordinary' train services, while more up-market 'intercity' and international trains costing ten times as much continue to be promoted. This is a phenomenon that will be familiar to Indian readers.

Striding Toward Energy Inefficiency

The problems of which Katowice is the main example go to the heart also of Communist-style Polish and Eastern European energy-use. Communist-style industrialisation meant the establishment of heavy industries with little or no regard either for the environmental impact of those industries or for efficiency in their use of energy. Poland, Czechoslovakia (now Czech Republic and Slovakia) and Hungary thus have one of the largest ratios of energy-use per unit of GNP. (This figure should be used with care, as GNPs expressed in $US say more about what a country's currency is worth on the money market than they do about goods and services actually available to local people. Thus, incomes it Poland, and other countries expressed in $US tell little about the real living conditions of people in those countries: - only that they are going to find overseas travel prohibltive.

This important point accepted, it is nonetheless true that massive opportunities exist for improvements in energy use efficiency, especially in the wasteful industrial sector. At the same time, those areas in which the right things were in fact done by the Communist regime, notably the widespread use of industrial waste heat for other industries and domes-

tic use (you can see the elephantine pipes all over Poland, especially round Katowice) - should be seen as things to build on and improve. The danger *is* that in the headlong rush to capitalism, they will be forgotten, and the energy efficiency of the country may in fact deteriorate.

Nuclear power is one area in which governments and their western partners perversely do want to build on and improve the Communist legacy. It is the one area where that legacy is most dangerous.

John Hallam.

The Arrogance of Resistance.

I listened attentively as a federal magistrate, explaining her guilty verdict, lectured me on the "arrogance" of people like me who place their beliefs above laws democratically arrived at by elected representatives of the people.

Was it arrogant of Martin Luther King, I wondered , to put his own beliefs above the democratically arrived at Jim Crow laws of the duly elected legislators of Alabama, Mississippi and Georgia?

Was it arrogant of Mohandas Gandhi to violate colonial salt tax laws duly enacted for India by the mother of parliaments?

And what might Magistrate Kathleen A. Jaudzemis think of the arrogance of Emma Goldman and Susan B. Anthony and other suffragettes whose violation of duly enacted all-male voting laws helped open up the

Radiation Like Death Comes Unexpectedly

The Radioactive Fallout of Enron Power Project

A Study of Radon Concentration Released into the Atmosphere due to Burning of Natural Gas is a tide of a paper by M. C. Subba Ramu, T. S. Muralidharan and K. G. Vohra of the Division of Radiological Protection of Bhabha Atomic Research Centre. In this paper they present their observation and estimate the dose received by a bystander due to burning of natural gas by the Tata Thermal Power Station and the Rashtriya Chemicals and Fertilisers at Trombay. They find the dose varies from season to season between 0.04 to 2.6 rems per year depending on various factors like wind, precipitation, geographical features, etc. They also state in this paper that the release of radon due to the burning of natural gas reduces considerably when the gas is processed to remove impurities and fractionated to recover the heavier hydrocarbons. In this process about 30 to 70 percent radon gets removed from natural gas.

Shri Ashok Kumar from Bombay, has raised this issue in connection with the proposed Enron power plant at Dabhol on the Konkan coast of Maharashtra. Again depending on various factors like wind, precipitation and geographical features, previous processing of gas to remove radon, etc. people in the vicinity of the plant might be in for a radiation dose of 0.4 rem to 25 rems per year in addition to other pollution burdens. 25 rems per year is 2500 times the dose recommended by the International Commission on Radiological Protection for the general public.

At a time when the newly installed government in Maharashtra is in the process of rethinking the Enron Project, it might be prudent for it to take this hitherto 'unknown' fact into consideration. Over the long term, this would be of greater consequence then the back-breaking financial burden imposed by the project.

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American political system, including the judiciary, to women?

The thought of those earlier practidoners of civil resistance brought me comfort as the magistrate droned on, citing with satisfaction the ruling of federal appeals court which upheld the conviction of four peace activists who had cited "God's law" in defence of the disabling of a Missouri missile site capable of launching a 1.2 megaton hydrogen bomb toward Soviet Russia.

Magistrate Jaudzemis was right. The higher court's ruling against the 1984 "Silo Pruning Hooks"(Carl and Paul Kabat, Helen Woodson, and Larry Cloud-Morgan) governed her decision in my case. International laws forbidding crimes against humanity did not justify my trespass at the nearby Air Force base which houses the headquarters of the federal government's nuclear war-fighting capabilities.

And she was right, I believe, in holding me accountable by sentencing me to the maximum of six months (a modest penalty in comparison with the punishment meted out these days to many for lesser crimes).

Like King, Gandhi, the suffragettes and others who break the law out of principle, I don't expect to escape responsibility. In fact, it is the punishment which sometimes paves the way for changes in the law. This willingness to "take the rap" is what transforms arrogance into humility and makes civil resistance a potentially powerful instrument of social change.

If laws sanctioning nuclear weapons and nuclear war were truly the product of legislative decisions democratically arrived at, as the court contends, then civil resistance would indeed be an act of arrogance. But they are not. Such laws are conceived in secret, born in ignorance, and shaped by vested interests which leave little room for fair and honest debate.

Just as Jim Crow and the all-male suffrage once rested on the bedrock of legal assumptions unchallenged by generations of law-makers, so do the assumptions underlying today's national secret laws. Missing from the votes over nuclear weapons systems and the billions of dollars appropriated for them is any consideration of the realities of nuclear weapons and consequences of their use.

Policies based on pre-nuclear warfighting concepts form the basis of laws that authorise the building of many thousands of nuclear warheads, some of them ten thousand times more powerful than the biggest conventional bomb ever dropped in World War II. Can it be said that such mindless genocidal policies are the product of laws democratically arrived at? Or does not the absence of rational discussions - in the halls of Congress and in the body politic - constitute a form of secrecy as effective as the strictest censorship laws?

Secrecy is the enemy of democracy. That is the point made by an extraordinary activist, Mordechai Vanunu, a former nuclear technician who risked his freedom by breaking the law eight years ago to tell a British newspaper about Israel's secret nuclear weapons facility where he had once worked. For this he is paying the price of 18 years in solitary confinement in Israel's maximum security prison. Vanunu believed that if Israel was to take this awesome step into nuclear weapons, thereby triggering a nuclear arms race with its Arab neighbours , then the decision to do so should be democratically arrived at, not taken in the deepest secrecy.

So is it, too, with Fr. Frank Cordaro, Brian Terrell, and others who have taken the lead in shining a light into the darkness of the Strategic Command (StratCom), field headquarters for US nuclear war-waging by breaking the trespass laws that protect Offutt Air Force Base near here. Although StratCom's role and mission are a matter of public record, the global implications of its existence are in every protected sense a secret to Congress and the American people.

Was it an "undue display of self-importance" for Mordechai Vanunu to take it upon himself to tell his fellow citizens of the potential nuclear oblivion prepared for them by their government in strictest secrecy?

Was it "overbearing haughtiness" of Frank Cardaro and his colleague Brian Terrell to put their bodies on the line at StratCom in hope of reaching the national conscience on the terrible secret within?

Or are those two just humble prophets of a reality that may some day be as unquestioned as the truths of Gandhi, King, Emma Goldman, and Susan B. Anthony.

Either way, I am happy to be in their company.

from Sam Day

THE EDITOR DESERVES CAPITAL PUNISHMENT FOR OMITTING THE LAST PAGE IN THE PREVIOUS ISSUE

The Disaster Last Time

The whole, last page went missing. My fault and I am sorry. The article to suffer amputation concerned the resolutions passed at the seminar on "Nuclear Safety and the Public" organised by INTACH in Delhi on February 3rd and 4th.

The following are some of the missing resolutions:

10. In view of the rigorous clinical tests carried out at Rawatbhata, and the statistically significant increase in incidence of diseases and deformities found amongst those living in the immediate vicinity of the plant, an independent study should be initiated to determine the safety implications of various plant operation practices.

11 The public right to information must be codified and given concrete form in terms of entitlements, as an intrinsic component of the process of approval of nuclear energy projects, in particular,

i) the right to appraise the need and rationale of the project.

ii) the right to appraise the hazards and associated risks to the public.

iii) the right to examine and set safety standards and norms.

Subscribtion Information

Rs. 30/- per year (6 issues) within India.
US$ 15/-per year or equivalent in other convertible currencies for airmail overseas.
Rs. 500/- for life (only within India.

Demand drafts should be drawn on State Bank of India Valod Branch (Code 0531). For cheques and drafts drawn on other banks, please add Rs. 10 as clearing charges.

Subscriptions, donations and. enquires regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, 394641 Gujarat India
Tel: 02625-2074

Please do not send personal cheques or drafts addressed to Surendra Gadekar

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Published by S. Gadekar for Sampoorna
Kranti Vidyalaya and printed at Tha Parijat
Printry, Ahmadabad

Printed Book

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 9 Number 1 August / September 1995

> *"All I ask is that, in the midst of a murderous world,*
> *we agree to reflect on murder and make a choice."*
>
> Albert Camus
> Neither Victims Nor Executioners

Fifty Years of US Nuclear Resistance

In August 1945, the mushroom clouds over Japan revealed to Gordon Maham the purpose of his secret government engineering job. He resigned from the Manhattan Project in protest, thus losing his draft exemption. Refusing post-war conscription, Maham was arrested and jailed for three yean as a conscientious objector.

In California, conscientious objector Bent Andersen was at the Civilian Public Service camp in Minersvillc doing alternative service, when he heard about the atomic bombs dropped on Hiroshima and Nagasaki. He left the camp and hitchhiked across the country, distributing leaflets as he went, which read in part, "Now is the time for the people of America to cry out that the first atomic bombs in history shall be the last! That war be waged no more! Anything less is moral and physical suicide." He was later arrested and imprisoned.

These acts of conscience ushered in the first SO years of anti-nuclear civil disobedience.

Organised non-violent resistance began in 1955, when Catholic Workers and other pacifists publicly refused to co-operate with civil defence drills in New York city. From this action a series of civil disobedience campaigns blossomed in the late 1950's. People were arrested at nuclear test sites in Nevada, the Pacific and Africa; missile bases in Cheyenne and Omaha; missile submarine shipyards in Connecticut; and California's Lawrence Livermore Laboratory, where the H-bomb was developed. Prison terms of six months were not uncommon and resistors were subject to public harassment and redbaiting.

Civil disobedience for nuclear disarmament faded along with the Ban the Bomb movement after above ground nuclear tests were banned in 1963. France's refusal to join the ban, and continued atmospheric testing in the Pacific, gave birth to the group Greenpeace in 1970. Like the Golden Rule and Phoenix voyages of the late 1950's, Greenpeace ships sailed into the South Pacific to disrupt scheduled French tests, and protest US nuclear tests in the Aleutian Islands.

Mass nuclear disarmament actions paralleled the growth of anti-nuclear power civil disobedience in the late *1970's.* Nuclear power plants from Scabrook, New Hampshire on the Atlantic coast to Diablo Canyon in California on the Pacific were sites of civil disobedience actions large and small. Participatory organising styles for non-violent direct actions featuring decision making by consensus were developed building on and moving beyond the practices of the civil-rights and the anti-war movements.

In 1978, organisers of the first national demonstration at the Rocky Flats plutonium processing plant near Denver planned a symbolic blockade of the railroad tracks to follow the legal demonstration. With participants from around the country, the action spontaneously grew into more than a year of resistance that overwhelmed local courts with hundreds of arrests. The encampment of the railroad tracks that served as springboard for repeated blockades preceded a wave of such resistance-oriented peace camps on both sides of the Atlantic in the 1980s.

Civil disobedience campaigns and faith based resistance communities were re-emerging on both coasts and in the missile fields of the mid-west. By the time deployment of Cruise and Pershing missiles in Europe was punctuated with the "winnable nuclear war" rhetoric of the Reagan administration, a widespread network of such communities and campaigns was active.

Since 1980, this movement of conscience in action has resulted, in the United States, in some 47,000 anti-nuclear arrests during at least 1,800 actions at more than 250 different sites. Resisters have been jailed for entering military bases, sitting-in at corporate and government offices, praying at nuclear weapons laboratories; blockading trucks and trains, nuclear power plants and nuclear dump sites; damaging weapons components and deployment systems in biblically-based "Plowshares" actions; and infiltrating test sites to impede actual nuclear weapons tests. Thousands have been imprisoned for a few days, hundreds for a month or more and dozens for one or more years.

As the nuclear age passes the half-century mark, direct action for nuclear disarmament continues, targeting advanced weapons and first-use strategies. A resurgence of resistance at nuclear power plants has also begun in mid 1990s, as ageing plants show risky signs of wear. The industry's production of irradiated nuclear fuel rods, the most dangerous of radioactive wastes, has begun to exceed safe storage capacity at many plants in the US and other countries, spurring citizen action and concern at sites across the country.

As we look to the challenges of the next 50 years, it is with great appreciation and respect that we remember the actions of so many people who have paved the way before us, showing us with their examples and their lives an active and conscientious response to the nuclear age.

The Nuclear Resistor July 7,1995

From the Editor's

CON-fusion prevails

Recently it seems, on one of his periodic visits abroad, Prime Minister Shri Narasimha Rao visited a fusion research laboratory and was suitably impressed. Taking advantage of his "good mood" a proposal for fusion research in India was mooted to him and grants worth Rs. 750 crores, sanctioned

The real horror of this story lies not in the fact that obscenely huge amount of money is being wasted; (it definitely is and not only in such esoteric activity as fusion); but that the scientific community considers this darbari style of functioning as perfectly normal and there is not a whimper of protest. Perhaps they feel that let the nucleocrats get away with their loot. Our time too would come. Even self-interest, which would dictate that the country's research kitty is by no means unlimited, and Rs. 750 crores not chicken feed, seems absent.

It is another issue altogether that the nucleocrats who have performed this fabulous heist have a long record of sterling non-performance when it comes to actually delivering what they promise. Even a cursory look at the operational record of nuclear power plants in the country would bear this out.

Fusion research is special, for it is not only our nucleocrats but everybody else's as well who love it since this black holes just gobbles huge amounts of resources and no energy ever need come out. Even countries with a fifty year tradition of fusion research, have nothing to show for their years of effort except futuristic labs to impress gullible visiting Prime Ministers. The present long term projections of the US Department of Energy regarding an operational commercial fusion reactor predict the possibility not before 2040. University of Maryland physicist, Robert Parks observes: "For years, we joked that fusion was 30 years away and always will be. Now most scientists say it is 50 or 60 years away."

Fire Derails Japanese Fast Breeder

On December 8, the Fast Breeder Reactor at Monju in Japan had an accident involving a leak of sodium coolant. Approximately four tones, of sodium leaked from the secondary cooling system. No leak of radiation was detected This was the largest leak ever recorded from the piping of operating reactor anywhere in the world

On December 11, the Fukui perfectural officials and later STA (Science and Technology Agency) officials along with PNC (power Reactor and Nuclear Fuel Development Corp.) staff surveyed the room where the leak occurred They concluded that the leak's source was a defective weld in a temperature probe attaching it to one of the 55 cm main secondary lines. The welding had been done in 1991 during remodelling of the whole loop due to a design fault

Video pictures show the extent of the damage. Sodium oxide and sodium hydroxide deposits were found mostly under and around the area of the defective tube but also throughout the room as well. This suggests that the sodium-water reaction was vigorous and lasted for hours spreading the reaction products everywhere.

Some steel structures showed evidence of melting, indicating that the sodium had caught fire reaching temperatures in excess of 1500 degrees centigrade. The video pictures of the room together with theoretical considerations strongly suggest that it was a spray fire, one of the most feared types of sodium reaction. This runs contrary to PNC's initial statement to the effect that; "a minor leakage in the secondary sodium loop caused some fumes."

In the course of the accident, the operators deviated repeatedly from standard operating procedure and were dangerously slow in reacting. Despite clear evidence of a leak, the operators took twelve minutes to respond. Even then, they slowly coasted the reactor down rather than implementing an immediate shutdown as standard operating procedure requires. On the second day after the leakage, PNC team entered the room and took video pictures. But the pictures released to the press showed only a corner of the room with intact pipes and a small amount of leaked sodium. This was a blatant attempt to play down the seriousness of the accident. In reality the damage was extensive with melted steel structures and reaction products spread throughout the room. This only came to the light after the perfectural survey team took and released the video pictures two days later.

Sodium and Air: A Dangerous Mix

Nuclear experts like liquid sodium as a coolant due to its high conductivity and low neutron absorbtion properties. Sodium in contact with either air or water causes an explosive reaction. Instead of abjuring industrial scale use of such dangerous materials, nucleocrats feel that the sweetness of the technological challenge is well worth the risk of blowing up whole populations.

PNC and STA now plan to drain the sodium and investigate the cause of the accident But draining the sodium is not an easy job and nobody knows how long the clean-up work will take. All the welding will need to be checked This can take a long time. Besides, Fukui Prefecture Government and other local governments will probably resist the restart of Monju. Tukio Kurita, the governor of Fukui Prefecture, has lodged a protest with Prime Minister Tomichi Murayama demanding that the government suspend its plans for Monju.

This fiasco has further corroborated what the anti-nuclear movement had been saying particularly against Monju and Japan's plutonium policy.

Jinzaburo Takagi: Citizens'

Nuclear

Implications far India

As it happens, India's uranium reserves are sparse and usually of poor quality ore. The Indian (pie in the sky) nuclear programme is, and has always been, predicated to the proposition that fast breeder reactors would work and produce large quantities of plutonium in the near future. Thus, the repeated failures of fast breeders in both France and Japan, are of special concern to Indian nucleocrats who can see their dreams of continued government largesse slowly dissolving. It is perhaps for this reason that they have of late become more interested in fusion rather than fission. Since, nobody anywhere has got any working model of a fusion power generator, one can safely work in this 'frontier' area, crores can be spent, with no awkward questions asked regarding performance.

Memories of Hiroshima

I was sixteen years old in the summer of 1945. In June, I had completed grade ten, and would enter grade eleven in September. I remember well the invasion of Normandy and the end of the European War. A young girl who lived two doors from my home had married her childhood sweetheart, a young neighbourhood boy in April 1945, and he was sent overseas almost immediately with the US army. His first battle was the invasion of Normandy, and he died on the beachhead. His young pregnant wife was devastated by the news. The pain of invasion could be felt throughout the neighbourhood, as we saw the build-up towards the invasion of Japan. Remember, we had heard horrible stories of the fighting in the Pacific Islands, most recently at Iwo Jima and Okinawa.

Then on 6 August 1945, the President announced that the US had dropped a new and awesome bomb on Hiroshima, and this might make it unnecessary to invade Japan. On August 9, a second bomb was dropped on Nagasaki. We were told that Japan's military ship building was the target. Then Japan surrendered and there would be no second bloody invasion to end the Pacific War. Everyone went crazy with celebration. My brother went to our Church and he, together with another boy, rang the Church bells for twenty minutes straight, until they were both exhausted. All of the Church bells in the city were ringing, and the people were out in the streets singing and laughing with joy. The boys were coming home. The war was over!

During the war there were many patriotic demands made on us, like rationing of food in short supply or needed by the troops. We also wrote letters to boys in service. I took on a slightly different type of letter writing. I wrote to boys who were conscientious objectors, who refused to kill. This was a very patriotic war and conscientious objectors were treated like dirt in the military. They had to put in their time in the service, but were given the most disagreeable jobs the military could find. I undertook to support them and try to keep up their morale. Killing, and what I understood as "bully power" merely biased the post-war negotiating process where the real decisions which carved out future relationships were made. The strongest, not the most just, got to "lay down the law." This merely set the stage for the next war, as the loser tried to build up the power to confront his oppressor.

On August 15, 1945, as all the neighbourhood was celebrating, my mother was strangely quiet. As she prepared the supper, I watched her stir the soup and keep repeating: "They should not have done it. They should not have done it." These words still haunt me. They were correct, but I do not know how my Mother knew, because the propaganda was so strong at the time.

My father served on the Financial Advisory Board of our Church. During the late 1940's, when there was a boom in the uranium mining industry, the Church wanted to invest in God's Lake Uranium Mining Company in Canada. My father strongly objected to this, and I heard him talking about it at home. Eventually, the Church withdrew its proposal and did not invest in the industry. There were no nuclear power plants at the time, so, as I now know, the only use for that uranium was bombs. Again I do not know how my father knew this or why he so vehcmently opposed this industry. He was a business man himself, the President of the Standard Mirror Company, which produced most of the automobile mirrors used in the Detroit car industry.

My mother was right 50 years ago. They should not have done it. My father was right when he said to leave uranium in the ground! I think that I am now right to call for an end to the lying and destructiveness of this industry which would steal from us the future life and health of our planet!

Dr. Rosalie Bertell

At the time, I was a ten year old living on the other end of the nuclear chain reaction in the federally planned city of Richland. Richland was home to the workers and families at the Hanford Engineering Works, a plutonium making facility 30 miles up the Columbia River.

We were elated when we heard the news of the bombing. People came out into the streets and raised a cheer: kids jumped around, did cartwheels, shadow-boxed each other. We had finally taught those Japs a lesson!

Trinity test bomb and Fat Man—the bomb which was dropped on Nagasaki—were plutonium bombs; therefore my dad's fingerprint's, so to speak, were on both.

Mervyn Witherup, my father, died on May 12, 1988 aged *77*. He died of prostrate cancer that had spread to his bone marrow. The prostrate is one of the organs that collects radionuclides. I have no doubt that Hanford killed my father. However, this is an issue which divides our family. My mother is very sure that work at Hanford did not cause her husbands cancer.

A pollster would find that most citizens in the area around Hanford, do not think that the radioactive and chemical wastes pose any problems to heath. These communities have lived basically off the government teat for fifty years—and where you draw your paycheque shapes your politics. Richland High School is home to Richland Bombers whose logo is a mushroom cloud.

Although it would be political suicide for President Clinton to apologise in the name of the American people for these acts of technological murder, the fiftieth anniversary of the atomic bombings provide a good opportunity to do so. The President would grow in stature and become a true statesman, and it would have a real psychological effect on nuclear disarmament.

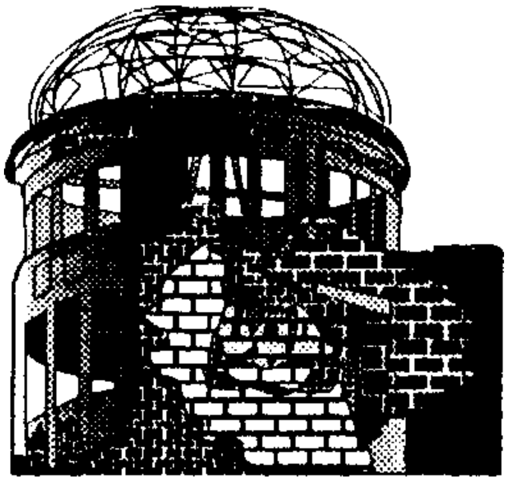
Bill Witherup
from The Bulletin of Atomic Scientists

My parents and two older sisters were in Hiroshima's Minami-machi area, two kilometres from the epicentre, when the atomic bomb was dropped. My eldest sister was three years old, and the next was born in February of the following year, which meant she as exposed while in the womb. My mother's parents, who lived about a kilometre away, died instantly amidst the roaring conflagration. I was born in 1949, four years after the bombing, and another four years after that, in 1953, my father died.

Although my mother had burn scars from her back up to her shoulders, she raised the three of us alone and in her weakened condition. She's now 83 years old A few years ago she broke a bone and is now confined to a wheelchair. Her life alternates between a senior citizens' home and my home.

So, I am a second generation Hibakusha. The hibakusha's perspective on today's society is coloured by their hellish experience. Just as it colours my father's death and my mother's life for me. I sometimes wonder that if the bomb hadn't been dropped maybe my father would still be alive, and my mother would have been spared so much suffering. Now that I am a father myself, I am not completely free of fear for the health of my own children, who are third-generation hibakusha.

Hiroshima has always been a good argument against the atomic bomb. But although the Cold War has supposedly come to an end, there are still many nuclear weapons throughout the world Due to nuclear weapons' testing and accidents in nuclear facilities, many people have become hibakusha.



A look at the area around Hiroshima shows that we're surrounded by war preparations. There is the US military base at Iwakuni, the Self-Defence Force bases at Kure and Kaita, US military ammunition dumps in several places and more. How can Hiroshima be the fountain-head of world-wide peace campaigning surrounded as it is by all these military installations? Living here in Hiroshima, I have seen its reconstruction and growth into a huge city, but it worries me that the Gembaku Dome now looks smaller both literally and figuratively.

The major challenge to the children of atomic bomb victims is how to use the Hiroshima experience to counter any repetition of past mistakes. This year I would be sitting down with my mother and listening carefully to my mother's stories of that time. It will be a source of spiritual energy that will guide me the rest of my life.

Shqji Kihara
NUKE-INFO Tokyo

I wasn't even born when the atom bombs were dropped fifty years ago. And yet I too have some thoughts to share since in a strange way my birth is linked to Hiroshima.

My father was a doctor of medicine specialising in radiology, who joined the British Indian Army since his private practice wasn't working too well. Within six months he was sent to Singapore where he became a prisoner of war of the Japanese at the fall of Singapore in August 1942. My mother had no news of him for more than three years. As prisoner of war, my father wasn't treated any worse than others. In fact being a doctor, he wasn't required to do the hard manual labour on the trans-Malaya railway, which proved a graveyard for many of his colleagues. Yet, by the time he returned after the Japanese surrender following Hiroshima, he was, I am told, just bare skin and bones having lost twenty kilogrammes in weight and had forgotten names of even his children. Under my mother's loving care, however, he recovered and then went on to do pioneering work in establishing radiology in India.

I believe that my parents had decided to have no more children long before I was born, but their delight in having survived the war made them change their minds. Would my father have survived without the atomic bombing of Hiroshima and Nagasaki? One never can tell about survival, but I personally doubt it

In September 1981, we were returning to India after a two years stay in the United States and took a short holiday in Japan and went to see Hiroshima. Today, Hiroshima is a modern city—a symbol of resurgent Japan. But underneath the surface there are scars of the misery the Bomb continues to inflict. Not even my father's life and my very existence I feel are worth that suffering.

Surendra Gadekar

French High-handedness on the High Seas

George Orwell points out a strange fact regarding behaviour of colonial masters. The violence needed to maintain the relationship of oppression ate away their own innards like a cancer so that the sufferers of colonial oppression were not only the colonised but also the colonisers. The recent 'troubles' in France reminded me anew the truth of this observation. Would the French state of Jacques Chirac behave in such a high-handed manner at home if it was not indulging in the same behaviour in Polynesia?

On July 10, ten years to the day after France bombed the *Rainbow Warrior* and killed photographer Fernando Pereira, some 150 French commandoes gave a repeat performance, surrounding and storming the ship as it sailed into the nuclear test exclusion zone. Tear gas canisters were thrown on board; doors and windows were smashed.

The raid happened just as the new *Rainbow Warrior* had entered the 12 mile exclusion zone around Mururoa nuclear test site at 5.00 A.M. local time, attempting to delay preparations for the French nuclear test. The *Rainbow Warrior* was rammed by a large tug, causing damage to its bow, before being towed to a mooring point inside the lagoon. Three out of four Greenpeace inflatables—launched outside the 12 mile exclusion zone at 2 A.M. and 3.30 AM local time succeeded in entering the lagoon and reaching the drilling rig, belying French claims that they had sufficient resources to repel Greenpeace. Two activists scaled the rig and occupied it for more than 20 minutes. The inflatables were then boarded by commandos after a two hour chase through the lagoon.

The 23 crew from both the inflatablcs and the *Rainbow Warrior* were transferred to Mururoa and held and interrogated by military police for more than 15 hours. Crew identified themselves as "Fernando Pereira".

"The best commemoration of Fernando's death we could offer was our action today" said Mills, one of the crew. "An end to nuclear testing now and forever is what Fernando would have wanted us to fight for."

International Piracy

At 7.30 AM, on October 25,1995 the *Altair* (59 meters long, 859 tons) entered the Mediterranean port of Brindisi along with four inflatablcs to block the French destroyer, *Dupleix* (139 meters, 4300 tons), which is armed with Exocet missiles.

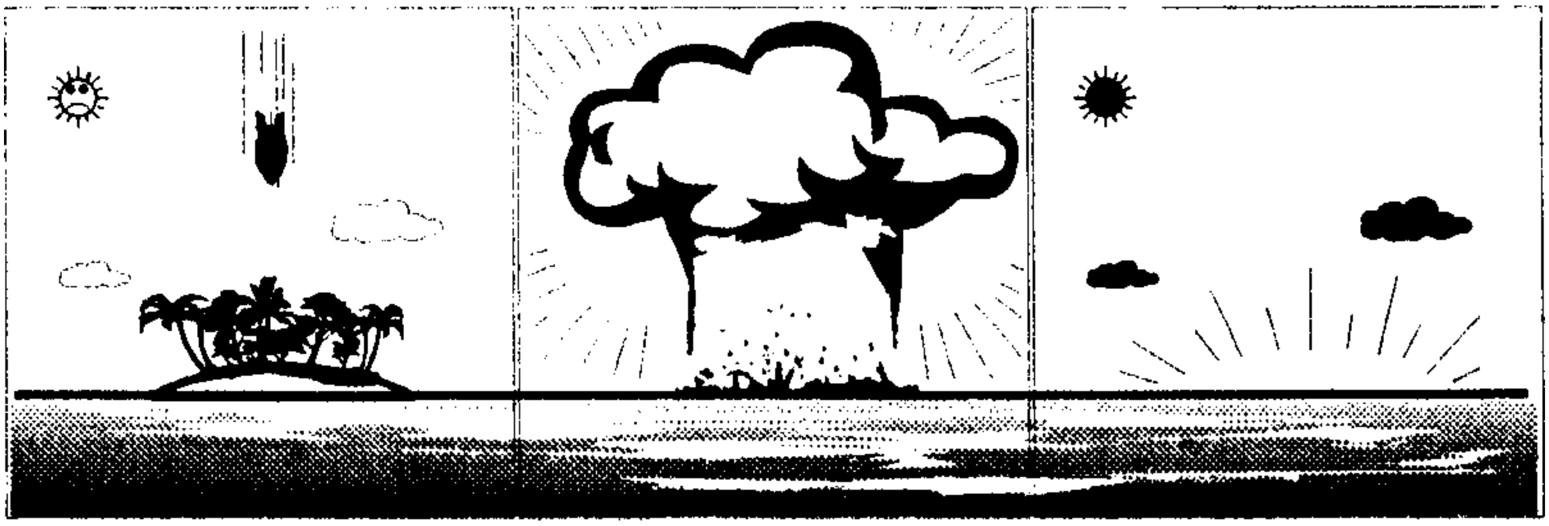
The *Altair* sent its inflatable with activists on board, who painted on the sides of the destroyer "Stop Nuclear Tests". In the meantime, four other activists chained themselves along the dock to the mooring ropes of the *Dupleix.* The crew of the *Dupleix* immediately shot at the inflatablcs with water cannon and started flooding the *Altair's* engine room.

At 8.40 AM, French Navy Soldiers armed with axes stormed the *Altair,* damaged the rudder and broke on the portholes. They threw tear gas into the engine room and forced the captain and crew members of *the Altair* to leave the ship. Having taken command of the *Altair,* the soldiers started the engines, put the gears into reverse and abandoned the vessel, which went full speed backwards into the harbour. The *Altair* nearly collided with other vessels (a speed boat of the Italian Financial Police and two Coast Guard speedboats) and then crashed several times against the dock. The fire brigade of Brindisi harbour intervened and managed to turn off the engine.

During the assault, *one Altair* crew member was injured and lost two teeth. "Greenpeace continues to work world-wide as a catalyst of international public opinion with peaceful demonstrative actions whenever possible to stop nuclear testing," said Captain Enever.

"The French assault is an act of international piracy," said Giusseppe Onufio, nuclear campaign spokesmen of Greenpeace Italy.

Terrain August & November 1995



Decolonisation: French Style

Mysterious Army Activity at Pokharan

Some curious developments have been taking place since November at Pokharan. The site has been fenced off. Boards declaring the area out of bounds have sprung up. Across the fence, there are even signs to suggest that earth movers have been used for excavation work on the site. And though the government has emphatically denied repeated US assertions that it is planning to conduct another nuclear test at Pokharan, nobody has any explanations to offer.

Three kilometres ahead of Loharki village, which in turn is some 34 km from Pokharan and adjacent to the nuclear-testing range, a dusty sand trail breaks off from the main road to lead to the nuclear site where the country conducted its first test on May 18,1974.

Six kilometres on foot into the desert, and over sand dunes, is the latest site, identified by a huge earth mound and shale rocks surrounding a crater. Twelve-feet-high concrete pillars support the barbed wire which fences of the site. The entire test site is surrounded by these pillars. A sign, freshly painted in red, prohibits entry into the area. An Army camp, a few kilometres behind the site, ensures people stay away from what could easily described as the most sensitive patch of barren land on the map of the country.

NEWYORK TIMES
INDIA ALL SET TO EXPLODE SECOND NUCLEAR BOMB

Recolonisation: American Style

Villagers of Loharki say the site was fenced recently and people were told not to venture near it. On close examination one the detect fresh bulldozer tracks, used for removing earth. One can also spot cement though no one has a clear idea of what use was it in the test site.

Villagers are puzzled why the government suddenly decide to fence off the test site in Range A, not used for anything after the 1974 test. Range A, demarcated by white pillars, located 200m apart, is spread over a huge expanse of undulating arid flatland pockmarked with sand dunes.

Another new edition to the landscape near the test site is a huge sand dune —the locals refer to it as a ti*bba* — which was not natural creation Those allowed entry into the test range to collect shell scrap say they have not come across the signs of any fresh tunnelling activity. Yet they say the tibba is unnatural, suggesting that only some recent excavation work could have created this.

The massive Pokharan testing range complex is divided into four ranges. While Range A is to be used exclusively for nuclear tests, ranges B and C are used by the Army for weapons trials and desert exercises. Range D is used by the Indian Air Force.

Those living in Hagi Bali Mohammed village, just outside the nuclear test range, say there was intense Army activity in and around Loharki village in November and the entire area was fenced to ward of outsiders.

"We are even not allowed to enter into our farms ... this kind of large Army deployment has not been witnessed by the villagers near Range A as far as we can remember," says Bhanwar Singh, former sarpanch of the Loharki village.

While there always has been routine firing of live ammunition and exercises in sectors B, C. and D by the Army and the Air Force, this is the first time in many years that top defence officials and a large Army presence have been seen inside Range A. Villagers such as Malka, just opposite the nuclear site, Kalan, Nautala, Etah, Palana, Hoparadi, and Tadama were abandoned as they were inside the test Range. Though reports of Loharki being abandoned appeared at that time, old-timers in the village denied they had been moved out-

Range A today is just a sea of sand and the top brass and defence personnel teeming in the area only a month ago have all gone. While firing and test exercises and being conducted on ranges B and C, the command posts set up in and around Loharki have long been dismantled. Dust winds have covered the area which had been used as a temporary helipad for the top brass.

Although the Americans have been maintaining that spy satellites picked up signs of cables being laid, villagers say the only activity they saw was the installation of a six-kilometres-long water pipeline leading to their village. But even this pipeline has since been removed by the Army.

When the correspondent tried to check with the Army officials, they simply said, " Nobody will answer these questions." Nor is anyone posted locally to provide answers to sensitive questions.

Shishir Gupta
Indian Express

China's Broken Hearts

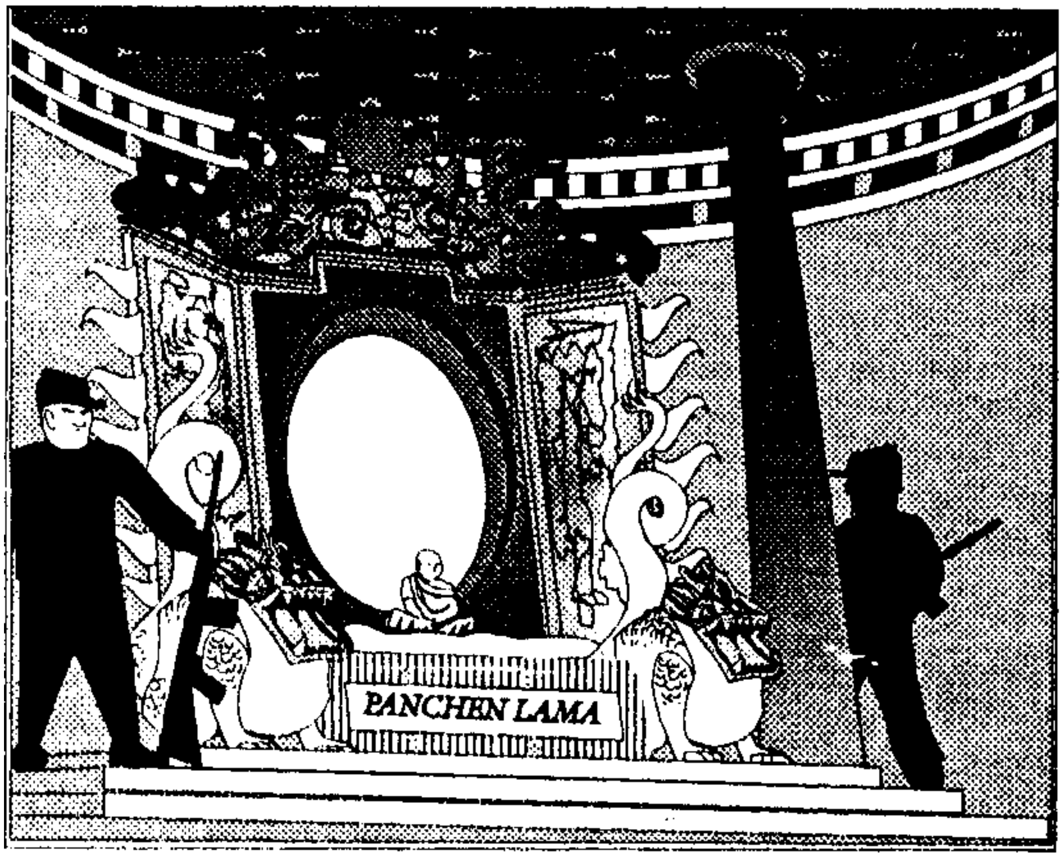
At one level, there is greater political tolerance in India than in China. And yet, par~~adoxically~~, Indian intellectuals especially scientists, are more timid in speaking out their minds and trying to influence public policy. Even an outright stupidity like the grant of Rs. 750 crores for fusion research has not drawn any sustained public criticism. This massive wastage of research funds is going to ultimately hurt them (scientists and researchers) the most. Hopefully, the following article will strengthen the backbone.

Ever since the massacre at Tiananmen Square six years ago, the scene that I saw with my own eyes has haunted me. On the morning of June 4, 1989, the blood of students was everywhere on the streets, and the name lists of hundreds of dead and wounded were hung on the gates of hospitals in Beijing. The deep wound in the hearts of the Chinese people will never be healed if the current Chinese Government verdict on it is not overturned.

Every year since 1989, as the anniversary of the massacre approaches, a few brave people petition the Chinese government to re-evaluate its verdict. On May 15, 1995 45 intellectuals asked the government in writing to stop regarding people of independent thought as "hostile elements." More broadly, the petition addressed to President Jiang Zemin and Qiao Shi, Chairman of the National People's Congress, asked the government to practice more tolerance toward dissidents.

Most of the petitioners are prominent old scientists, very senior and influential. They include, Wang Ganchang, 88, one of China's best known physicist and a key member of the team that developed China's first atom bomb, tested in 1964.

The petition called upon the Chinese government to live up to a U. N. resolution that proclaimed 1995 as "The United Nations Year of Tolerance." It noted that China was a founding member of the United Nations and it holds a permanent seat in the security council. "China should conscientiously implement this resolution, so that this spirit of tolerance, a spirit with which our country is relatively unfamiliar, may take root and flourish in areas like our country's politics, thought, religion, culture and education."



Decolonisation: Chinese

The petition calls for a revaluation of the June 4,1989, incident and the release of those people who remain in jail. Governmental leaders surely know that the longer the revaluation is postponed, the harder it will be for the wounds in the hearts of the Chinese people to heal and the more bitter will be their feelings toward the government.

The May 15 petition is not likely to change the attitude of the Chinese government toward the Tiananmen tragedy. On the contrary, they have detained some leading dissidents, put many of the petitioners under virtual house arrest, and they have continued to harass those who publicly voice their ideological differences.

As they punish outspoken dissidents, the Chinese government says that protests threaten social stability. But history suggests that when repression overrides tolerance, there will never be lasting social stability. Repression can maintain surface stability for many years but never forever. Social stability can be realised only by adhering to the rule of law, permitting freedom of speech and by tolerating different political views and diverse ideologies. The current leaders are stubbornly blind to the fact that if the government fails to take the lead in reversing the official verdict on Tiananmen Square, the people will someday force them to do so.

China is heading toward a democratic future. No one and nothing can stop that

Lee Zbee
The Bulletin of Atomic Scientists
July/August 1995

Hidden Killers

The Landmine Scandal

One of the most dreadful pictures that I have recently seen was of a little boy covered in blood. The stump of one leg poked out from the rags covering him. He was the victim of an Afghan landmine and could not have been more than six or seven years old.

There could be many such pictures, for it is often the children who suffer. World-wide, landmines kill 800 people every month and mutilate many more. Since there are about 100 million unexploded mines in place in over 60 different countries, and another 100 million stockpiled, they will continue to mutilate and maim for many years to come. UNICEF estimates that for every 20 of the world's children, there is one active landmine. They have become the cheap portable weapons of terror, with civilians often the chosen target. Some are planted by ground troops; some scattered by artillery shells; and many, as in Laos, dropped randomly from planes.

Today these mines are tiny instruments of calculated cruelty. The M-14 American anti-personnel mine measures only 4 x 5.5 centimetres and is almost impossible to detect visually. The Italian Valmara bounding mine 69 is a vile device which is hurled several feet up in the air before it explodes, firing hundreds of ball bearings or steel tubes out to a range of 30 metres. A new horror is the use of plastic shrapnel makes it undetectable by X-ray if any victim can get near an X-ray machine.

Oxfam has called them "weapons of mass destruction in slow motion." In Cambodia, where every citizen in 236 has had a limb amputed—compared to one in 22,000 in United States—landmines caused half the casualties in the twelve year civil war.

Today there are 19 million refugees in the world who have fled from their countries as a result of armed conflict and another 25 million displaced people. Landmines are undoubtedly the biggest impediment to refugees going home, because of the high risk in areas of recent conflict. Poor farmers in places like Cambodia or Mozambique have two options: take the risk of ploughing a field and be killed or have an arm or leg blown off, or stay out of the field and go hungry.

Where do these mines come from? Not from the countries where they cause destruction. Between 1970 and 1992, according to Pax Christi, 28 companies in Austria, Belgium, Britain, France, Germany, Greece, Italy, Portugal, Sweden, Spain and Turkey produced several million landmines.

There are, however, substantial signs of hope. A one year moratorium on landmine export declared by the United States in 1992 has been extended. President Clinton has written to over 40 countries which produce landmines asking them to halt exporting for three to five years. In November 1993 the General Assembly of the United Nations called for a global moratorium on exports for three years. This proposal received an affirmative British vote but with an explanation which effectively emasculated it: "Anti-personnel mines directed at military targets are a legitimate form of self-defence...If self destructing or self neutralising, they do not pose grave dangers to civilian populations." It is generally agreed, however, that the failure rate even with self-neutralising systems is at least ten percent, and could be much higher.

The coalitions opposing

The Convention to Outlaw Landmines Self-Destructs

The Inhumane Weapons Convention Review was held in Vienna. After three weeks of discussion it ended in a stand-off. At the beginning of the review conference, amputees presented the delegates with 1.7 million signatures from people in 53 countries calling for a complete and total ban. Yet the delegates did not concent themselves with the humanitarian cost of 100 million landmines contaminating 64 countries around the world. They were more interested in finding exemptions for their mine systems.

States from the South especially India, Pakistan and China would not accept the Western technological solution of self-destructing and self-deactivating mines which would inevitably cost a great deal more than "conventional" mines. The Western block in turn would not agree to inexpensive transfer of technology needed to manufacture such "smart" mines. And nobody agreed to a simple suggestion of holding the next review meeting in a mine infested territory to gain first-hand experience.

In the three weeks while delegates talked and discussed, more than 1600 people around the world were killed or maimed by landmines.

greatly strengthened treaty which would ban production as well as export, cover the civil wars which arc almost the norm today, and oblige suppliers and users to fund major clearance and recovery programmes. Granted the increasing disgust at the continuing slaughter of civilians, some of those aims may well be achieved

Meanwhile, support is needed for one very effective non-governmental mine clearance operation. The Mines Advisory Group was founded by Rac McGrath, who served as a soldier in the British Army for 17 years. His experience in clearing mines in Afghanistan for the United Nations in 1988 led him to found this remarkable charity in 1990. The group now has a team of over 600 workers clearing mines in Kurdistan, Cambodia, Laos, and Angola. Most of those trained for this dangerous work are natives of the countries concerned. One worker has been killed by a mine and another in northern Iraq murdered But in the five years since it was founded, the group has succeeded in removing thousands of mines.

Such humanitarian work is beyond praise. But alongside it must go the effort to build the structure of a genuine global community. Just-war theorists and promoters of non-violence can on this issue unite in efforts to make war and its ghastly consequences at least less likely.

Bruce Kent
The Catholic Radical
Dec 1995/January 1996

Are Atomic Bombs Legal?

The International Court of Justice About to Give Its Verdict

Fifty years after atomic bombs devastated Hiroshima and Nagasaki, the International Court of Justice, is preparing to make a landmark, though non-binding, pronouncement on the legality of nuclear weapons, as the United Nations' main judicial body, the court has been asked by the World Health Organisation and the U. N. General Assembly to deliver an advisory opinion on the issue.

This is supported by the World Court Project, which is an international alliance of citizens' groups. It was founded in 1992 with the aim of bringing the legality of nuclear weapons before the International Court of Justice at The Hague. The co-founding organisations are the International Peace Bureau (IPB), the International Association of Lawyers Against Nuclear Arms (IALANA) and International Physicians for the Prevention of Nuclear War (IPPNW).

The court is now considering whether the use or threat of use of nuclear weapons is permitted under international law. It is expected to make its ruling early in 1996.

Peter Weiss, one of the lawyers working for the World Court Project, believes that nothing but good can come out of this historic hear-in "If a majority of the court says that nuclear weapons are legal, there will be a tremendous push to get a convention outlawing them like the treaties abolishing biological and chemical weapons. If a majority says that they are totally illegal, that will give a strong impetus to the movement to implement the court's decision.

The World Court Project believes that clarification of the law by the International Court of Justice is a vital step towards the global abolition of nuclear weapons.

43 states, a record number, have made written submissions to the World Court on the question of whether the threat or use of nuclear weapons violates international law. Oral proceedings were held from 30 October, to 15 November, 1995 which were open to the public.

The advocate for World Health Organisation gave a sober and detailed account of the special nature of nuclear weapons, stressing their radiological effects which are impossible to contain either in space or time.

France argued that nuclear weapons are not fundamentally different from other weapons. When the use of armed force is legal, there ought not to be any prohibition on nuclear weapons. Germany and Italy, both members of the NATO nuclear alliance, supported nuclear legality, arguing that disarmament negotiations might be endangered by a Court ruling. Since the only negotiations underway concern the Comprehensive Test Ban Treaty and control of fissile materials, it is difficult to see how this argument applies.

Russia followed the line of other nuclear weapons state, arguing that there are no specific treaties on nuclear weapons and that humanitarian law does not apply in this case.

However, Egypt, Mexico, Iran, Indonesia, The Solomon Islands, Samoa, Australia, New Zealand, San Marino, The Marshall Islands, Qatar, Malaysia, Costa Rica, The Philippines and Zimbabwe produced strong antinuclear arguments, presented with great coherence. Mexico and Iran warned of their potential withdrawal from Nuclear Non-proliferation Treaty should the nuclear weapons states fail to fulfil their disarmament objections. Malaysiacalled on the court to reject the nuclear domination of the big five and rule in favour of the vast majority of countries supporting the illegality of nuclear weapons. Australia, in a stunning reversal of its previous support to US nuclear policy, argued that self-defence is not a justification for genocide or for indiscriminate attacks on the civilian population. Foreign minister, Gareth Evans concluded that "it is illegal not only to use or threaten to use nuclear weapons, but to acquire, develop, test or possess them." In a direct challenge to the nuclear weapons states he declared that they must "within a reasonable period of time, take systematic action to eliminate completely all nuclear weapons.

Japan, in spite of heavy US pressure, argued that nuclear weapons are clearly contrary to the spirit of humanity that gives international law its philosophical foundation, but stopped short of concluding that the weapons are illegal. The ambassador then presented the mayors of Hiroshima and Nagasaki emphasising that their testimony was independent of the government's view. The mayors reminded the court the mind-numbing damage these weapons brought to their cities.

Co-ordinating their presentations, Samoa, and the Marshall and Solomon Islands, expressed their outrage at nuclear testing and the suffering it had caused.

On the final day, UK and USA insisted that the court should refuse to give a ruling. United States defended nuclear deterrence by claiming that it had preserved peace for the last fifty years and the UK said that calling it into question would be profoundly destabilising. Both states argued that since the nuclear states have built up large arsenals and no treaty specifically prohibits nuclear weapons, the court cannot rely on an international consensus of illegality.

Besides the government presentations, the court received over 3 million declarations, which citizens all over the world had sent in against nuclear weapons.

Colin Archer
WISE News Communiqui 443

The Cold War's Continuing Casualties

Since the Manhattan Project, the United States has spent more than $4 trillion and employed more than 500,000 workers to develop and produce nuclear weapons. As nuclear weapons production workers confront thousands of layoffs, they are concerned that occupation-related health problems are a low priority for the government

The preliminary results of health assessments of nuclear weapons production workers conducted by Elizabeth Averill Samaras for the Alice Hamilton College of the Oil, Chemical and Atomic Workers International Union (OCAW) reveal worker concerns about future health problems, inadequate health insurance and high levels of exposure to substances such as ionising radiation, beryllium, asbestos and carbon tetrachloride.

The US Department of Energy (DOE) is spending $6.5' billion every year "remediating" sites contaminated with nuclear waste. Ironically the department is not spending anything on remedial activities for workers who have been contaminated. These nuclear veterans have a statutory entitlement to medical surveillance and exams that have never been funded.

Beryllium Boom and Bust

In the mid-1950s, the Atomic Energy Commission awarded the Beryllium Corporation of America a five year $23 million contract to produce 500,000 tonnes of beryllium — a strong but malleable metal used extensively in nuclear, electronics and aerospace industries. Beryllium Corporation came to Hazelton, Pennsylvania in 1957 and brought with it a welcome economic stimulus and a source of steady employment. More than 1200 people worked in the factory till it closed down in 1980 and refined thousands of tonnes of beryllium ore into metal. But now, almost 40 years later, all that remains of the enterprise is a legacy of occupational disease.

At the time the Hazelton beryllium plant was designed, scientists already knew about the dangers posed by exposure to beryllium dust. Workers confronting high exposure levels commonly develop acute symptoms similar to bronchitis or pneumonia. Lower exposure levels can cause chronic beryllium disease (CBD) — characterised by lung inflammation and scarring — including granuloma, the growth of tumour like masses of capillaries on the lung surface. CBD can sometime take several decades to develop. When it does show up, it can become a seriously disabling disease with such symptoms as shortness of breath, coughing, chest pain, fatigue, loss of appetite and weight Most CBD victims are able to control these symptoms with drugs , though the disease can be fatal without early detection and treatment

Air quality standards for beryllium dust were set by the Atomic Energy Commission in 1950, seven years before the beryllium plant came to Hazelton. In 1993, a local newspaper, Wilkes-Barre Times Leader, uncovered AEC documents that revealed that a 1958 air sample taken at the Hazelton plant found beryllium dust levels that were 330 times the maximum allowed. Air samples were taken at the plant at least twice a year. These samples exceeded the regulatory standard in 15 reports uncovered by the Times-Leader though the company had installed new air filtration equipment in 1958.

AEC's exit

After the expiry of Hazelton Plant's government contract in 1962, the company's chief customers became private industries. As a result, regulatory responsibility for the health and safety of the plant workers shifted from the ABC to the Pennsylvania state Department of Health. In the mid-1960s, the Hazelton beryllium plant was bought by Kawecki-Beryl-co., which sold the plant to the Cabot Corporation in 1978.

In 1970, the workers at the plant unionised with the Oil, Chemical and Atomic Workers International Union (OCAW). Company doctors told workers — many of whom had previously worked in coal mines — that the symptoms they were describing were 'miner's asthma.' Upon learning from the workers about conditions inside the plant, the OCAW brought in doctors and an industrial hygienist. Independent medical consultations led to the diagnosis seven cases of beryllium disease amongst employees who had already been cleared by company doctors.

OCAW also fought to obtain records of air sampling conducted by the Pennsylvania Department of Health. Some of these records were eventually released indicating high levels of exposure to beryllium dust at the Hazelton plant

Beryllium reaper

Former workers and their families blame more than 90 deaths on the elevated beryllium levels. Jim Leonard, son of a former worker and an advocate for their cause contacted the OCAW in 1992, in response to the rising number of illnesses amongst former plant workers. Leonard's father, Albert, worked at the plant from 1960 to 1973. "Almost from the beginning of his employment my father was sick," says Leonard. "It started with skin rashes. Then he developed a cough. As he was coughing, a clear liquid would come out of his lungs. He just never felt right or normal after that" Albert Leonard died from beryllium disease in 1986 at age 58.

Premature deaths of workers could and should have been prevented since the government and the doctors knew about the hazards of beryllium exposure. After exposure, early detection and intervention — which can often control the symptoms of the disease — is vital to the lives of remaining workers. Medical screening — which costs $300 per worker— can help monitor the symptoms of the disease. Once detected, treatment can begin.

Amongst former Hazelton plant employees facing increased risk of beryllium exposure disease, nearly 1200 are still alive. Because beryllium disease can take 20 years to surface, workers often experience the health consequences of their jobs long after Pennsylvania's six-year statute of limitations on worker's compensation runs out

Lawsuits to get medical help to workers have failed. The courts have ruled that workers cannot prove that their employers intentionally injured them. The corporations have argued that, once excessive exposure levels were detected, workers were issued respirators. Plant management also took yearly chest X-rays to detect beryllium disease and installed safety equipment in 1970s.

Although the courts have ruled that Cabot Corporation has no legal responsibility for the health of former workers, it has also held the plant responsible for environmental damage and ordered the corporation to spend $4 million to clean up the site. "Millions of dollars will be spent to cover or bury the shit left over, yet they won't spend a few thousand on the workers," a former worker said at a meeting organised by OCAW.

Reluctant DOE

Denied medical assistance by the owners of the beryllium plant and state workers' compensation programme, former Hazelton workers sought DOE relief. Given that the beryllium processed at Hazelton supplied US nuclear weapons fabrication facility at Rocky Flats and Oakridge, and also the fact that there already exists health monitoring of past and present workers at both these facilities, The workers' union appealed to energy secretary Hazel O'Leary to include them in this government programme as well. After an eight month delay, there appeal was turned down on the ground that "there is no apparent legislative authority." However, after intense lobbying by supporters including, members of the House of Representatives, DOE has indicated that an award of $400,000 will soon be announced to fund a programme of beryllium medical research and surveillance. The award is expected to include medical screening of at least some former Hazelton workers.

Katherins Issac
Multinational Monitor October 1995

Potatoes Were Guarded Better

On November 27,1993, at about 1.00 a.m., Capt. Alexei Tikhomirov slipped through an unprotected gate and into the Sevmorput shipyard near Murmansk—one of the Russian Navy's main storage facilities for nuclear fuel. The 35 year-old deputy chief engineer then climbed through one of the main holes in the fence surrounding the "Fuel Storage Area 3-30", sawed through a padlock on the back door, and pried open the door with a metal pole he found next to the building. Once inside, Tikhomirov located the containers of fresh submarine fuel, lifted the lid off container No. 23, and broke off parts of three assemblies for a VM-4-AM reactor core. Stuffing the pieces (containing 4.5 kilograms of enriched uranium) into a bag, he retraced his steps.

Outside the shipyard he was met by an accomplice, former naval officer Oleg Baranov. Baranov dropped Tikhomirov off at his home, and then drove to the nearby town of Polyarny, where he hid the nuclear material in his garage.

The third man behind this operation was Dmitry Tikhomirov, Alexei's younger brother, who at the time of the theft was chief of the refuelling division at the shipyard. He had briefed his brother about security at the site, the holes in the fence, and the design of the fuel assembly.

None of the conspirators had a prior criminal record. They also lacked contacts for selling the stolen material, for which they hoped to receive $50,000. According to the official record of the investigation, they waited six months before they began to search for customers. But when Dmitry Tikhomirov told a fellow officer about the theft and asked for help in selling the stolen merchandise, the conversation was reported to authorities. In late June 1994, the three conspirators were ar-

Tempting Targets

Enriched uranium is the standard fuel for propulsion reactors used in both Russian submarines and surface ships. The level of enrichment varies depending upon the type of vessel from 20 per cent to weapon's grade (90 per cent). Soviet Union built over 250 nuclear power vessels. Most of these vessels have two pressurised water reactors which, under normal operating conditions require refuelling every seven to ten years. The cores of these reactors hold typically between 200 to 300 fuel assemblies, each containing several fuel rods. If this fuel has been enriched to 90 percent or higher, about 10 fuel assemblies could supply enough uranium for a bomb.

Huge stocks of fresh fuel are stored in five main storage sites. Shipyard No. 35 at Sevmorput near Murmansk, the "Sevmash" Shipbuilding Plant at Severodvinsk, the naval base at Zapadnaya Litsa west of Murmansk, and two "technical repair bases" near the Gornyak Shipyard at Krashennikova rested and the stolen goods recovered.

The theft itself was discovered only 12 hours after it occurred.. Carelessly, Alexei Tikhomirov had left the back door of the storage building open. Two guards on patrol noticed the discarded padlock and the broken door seal, and a prompt search revealed the broken fuel assemblies.

Holes in the fance

According to Mikhail Kulik, the special investigator for the Northern Fleet Military Procuracy—and the chief investigator of the Sevmorput diversion—potatoes were guarded better than radioactive materials at the time of the theft at Murmansk. "On the side of the shipyard facing the Kola Bay, there is no fence at all. You could take a dinghy, sail right in—especially at night—and do whatever you wanted. On the side facing the Murmansk industrial zone there are holes in the fences everywhere. And even in those places where there aren't any holes, any child could knock over the half-rotten wooden fence boards."

Kulik reports that some security improvements were made after the discovery of the theft. The number of guards were increased and they were issued walkie-talkie sets. Planks were nailed to cover some of the holes in the fence. More sophisticated security systems, although proposed were not put in place because of cost. Reportedly, there still are no surveillance cameras around the perimeter, and the integrity of the fuel containers is checked by sight only. According to Kulik, the first and last time the contents of most of the containers was checked was at the fuel-fabrication plant. He believes the diversion at Sevmorput "could have been concealed for 10 years or longer," had the open door of the storage building not attracted the guards' attention.

The case highlights the difficulty of guarding against the "insider threat", which is the greatest security danger, according to Russian nuclear safeguards officials. The current crises in Russia has eroded human reliability. A combination of factors—the end of Cold War, the accident at Chernobyl, the contraction of Russian defence and nuclear sectors, and the inability of the state to subsidise previously privileged workers in the nuclear industry and the military—has resulted in tremendous economic and social upheaval. Moral standards have eroded. As a result the primary threat to nuclear safeguards in Russia today is a knowledgeable and corrupt insider (or group of insiders) who have access to nuclear materials and may attempt to steal them for profit, for political reasons, or because they are coerced by a criminal organisation.

At the time of this writing, Alexei and Dmitry Tikhomirov and Oleg Baranov were standing trial in Murmansk for their involvement in the theft of naval reactor fuel from the Sevmorput shipyard. The hole in the fence that Alexci climbed through to gain entry to the storage facility is said to be patched shut. But the underlying gaps in the Russian safeguards system remain.

Edited from an article by Oleg Bukharin and William Potter in Bulletin of Atomic Scientists May/June 1995

Book Review

With Hiroshima Eyes : Atomic War, Nuclear Extortion and Moral Imagination

Joseph Gerson

New Society Publishers, 4527 Springfield Ave. Philadelphia PA 19143 USA

First a few quotes to set the scene.

"When you have to deal with a beast, you have to treat him as a beast."

President Truman in a later to Council of Churches of Christ in America just two days after the atomic bombing of Nagasaki

"The United States dropped the bomb to end the war against Japan and thereby to stop the Russians in Asia, and to give them sober pause in eastern Europe."

William Appleman Williams in The Tragedy if American Diplomacy 1962

"The consensus among scholars is that the bomb was not needed
to avoid an invasion of Japan. It is clear that alternatives to the bomb existed and that Truman and his advisers knew it."

The official historian of the US Nuclear Regulatory Commission, J Samuel Walker

"No one expected the invasion of Japan to be anything but a slaughter. Before the Japanese mainland could be secured, American casualties would amount to as many as one million men; and the Japanese were expected to sacrifice twice that number in defence of their homeland. Then on July 16, the bright glow of the Trinity test raised hopes that the war could be ended without an invasion.

American Heritage Junior library

"It is my opinion that the use of this barbarous weapon at Hiroshima and Nagasaki was of no material assistance in our war against Japan. The Japanese were almost defeated and ready to surrender In being the first to use it, we adopted an ethical standard common to the barbarians of the dark ages."

Fleet Admiral Willian D. Leahy, Chairman, Joint Chiefs of Staff for US, during the Second World War

We don't know anything about my younger brother. He was six years old. Even when people were burnt to death, you could usually find the bones and at least say, this is my house, so this must be them, but we found nothing. They must have been blown away somewhere.

Yasuko Kumura

Was Japan Always the Target?

Urgency to build the atomic bomb was most felt by scientists who bad fled Europe fearing Hitter. But was Hitter's Germany ever the target? New research suggests otherwise.

The first targeting discussion—insofar as can be determined from declassified documents and Manhattan Project histories—seems to have occurred during a meeting of the high-level Military Policy Committee on May 5,1943. According to Gen. Leslie Grove's summary of the meeting:

"The point of use of the first bomb was discussed and the general view appeared to be that its best point of use would be on a Japanese fleet concentration in the Harbour of Truk (in the Pacific, north of New Guinea). Gen. Styer suggested Tokyo but it was pointed out that the bomb should be use where, if it failed to go off, it would land in water of sufficient depth to prevent easy salvage. The Japanese were selected as they would not be so apt to secure knowledge from it as would the Germans."

"Always the Target" Arjun Makbijani

On August 6th—Hiroshima Day—Sanghamitra was giving a talk on "the implication of the Bomb for us today," at a local college. Immediately after the talk the Principal of the college got up. He was livid. "You say that the atomic bomb was not necessary to end the war! That Japan was already willing to surrender! Well, my information is different" and he proceeded to harangue the poor students regarding how the Bomb helped prevent millions of deaths in a prolonged war.

This incident is a small illustration of the pervasive effect of propaganda. Lies about the use of the bomb have been broadcast with atomic force so that today it is difficult to disentangle the truth from self-justifying myths. Considering that such is the situation in a small village in India—effectively a bystander in the conflict 50 years ago, the strong reaction amongst militarists in the US to the Smithsonian Institutions small attempt to educate the public becomes understandable. Debunking erroneous official versions of history is not an easy task.

It is for this reason, that Joseph Gerson's book "With Hiroshima Eyes" is doubly welcome. The stated aim of the book is to emphasise three points:

* Nuclear weapons have always been targeted against human beings.

United States practice of nuclear extortion has been an essential element of the maintenance and expansion of its global sphere of influence.

Politically engaged hibakusha are an undervalued moral and political exemplars for all people.

It is the third point mentioned above which the book brings out brilliantly. Hibakusha through their suffering and resilience are indeed *"testimonies to the possiblities of human courage, compassion and a life-affirming future.* Fifty years after the event, the Hibakusha are slowly dying out. Soon there would be nobody with a first-hand experience of nuclear holocaust. The book brings out vividly the urgency in the statement of Masanori Ichioka, *"The hibakusha feel that they must not die until the abolition of nuclear weapons is realised"*

All US administrations since the Second World War have claimed that the nuclear arsenal was needed to maintain nuclear deterrance. This book shows that the nuclear umbrella, served an even more important function: it allowed the US unhindered access to Third World resources. However, sections of the book dealing with this role of nuclear weapons in preserving US hegemony and control are unfortunately not as well delineated. Although Gerson, gives a list of 26 incidents of nuclear extortion from 1945 to 1993, the list omits some glaring instances of nuclear extortion. For instance, the notorious 'tilt' in US policy during the Indi-Pak conflict of 1971 and the sending of the nuclear armed aircraft carrier "Enterprise" to Indian Ocean is conspicuously absent

An important point which the book fails to address deals with the feet that *all* nuclear weapons powers and even other states which believe in nuclear weapons as a currency of power, have used the concept of national "sacrifice zones" whose populations have been knowingly subjected to radioactive assaults. Native Americans of the Southwest, Pacific islanders, Australian aborigines, Algerian and Tibetan nomads, Kazhakistanis, Eskimos of the Soviet Arctic, the people around Pokhran—all are hibakushas. In fact, there is no need to fall into the artificial atoms for war atoms for peace divide. The victims of nuclear power madness run into millions all over the world.

These reservations are mere nit-picking on my part. This is a fine book which needs to be read seriously in India especially now as we too seem inclined to join the gang.

Letter (Box

A nuclear free India will not materialise out of default, nor will it evolve from knee-jerk reactions from activists hungrily awaiting to pounce on every verbal contradiction of nucleocrats—nor from uncovering reasons proving economic unviability nor the hazardous nature of of nuclear pollutants.

However sincere the efforts are, unfortunately, they are still in the realm of reactions. Historically and logically, these exercises arise AFTER the establishment acts—a dome collapses or Tarapur leaks. Perhaps activists should devote their time to energy alternatives that make ecological and economic sense.

Here, in the northern hills of Kerala, there are vast areas of lush greenery and sparkling streams. Electricity, as usual, goes to the urban centres, resulting in voltages as low as 10-15 V in Alakode! Amidst these oasis of almost pristine splendour, if a capital intensive, ecologically disastrous project were to arise, funding would flow from "tourism". And, of course, one more protest group, along with its newsletter, will be born.

Perhaps, if your journal can devote some space to realistic alternatives in energy generation, we could send you documented cases of communities attempting to solve their energy needs. In the meanwhile, we are totally with you in your devotion to a nuclear free India.

Peter Patrao The PEdal & Turbine Energy Research Trust

Su6sctiption

Rs. 30/- per year (6 issues) (within India)
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/- Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampoorna Kranti Vidyalaya
Vedchhi, 394 641 India
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Published by S. Gadekar for Sempeerna Kranti Vidyalaya and
Printed by him at The Parijat Printry Ahmedabad.

PRINTED MATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 9 Number 2 October / November 1995

Study Them To Death

" The desire for hard evidence has left victims of Chernobyl disaster limiting nearly ten years, and much inaction has hidden behind what will always remain unquantifiable".

The Secretary General of The United Nations

The International Atomic Energy Agency has a vested interest to see that radiation health damage remains forever unquantifiable, as this state of "unknowing" favours the expansion of the nuclear industries.

Dr. Rosalie Bertell

A large international conference was held in Geneva on 20-23 Nov. 1995, on the consequences of the Chernobyl nuclear accident The most important item for discussion was a report of a study by the World Health Organisation (WHO) which involved 7,000 scientists. The main result: there is a lot more research necessary. This will take several years and will cost another US $200 million. The study which started in 1992, has already cost US $ 35 million.

At the conference, the atmosphere smacked of the victims being part of a gigantic experiment.Since medical ethics forbid deliberate large Kale contamination simply for the purpose of conducting research, the attitude seemed to be, if the people are contaminated anyway, you, as a scientist have a marvellous opportunity.

For instance, scientists of the Moscow Medical Radiological Research Institute investigated the teeth of 200,000 people. By measuring the quantity of carbon dioxide in teeth, scientists ascertained the level of radiation people received. A number of scientists reported during the conference that finding out the level of radiation received was not a piece of cake. Tens of calculation models had to be drawn up, and dozens of scientists were needed to resolve the problems which arose in the course of establishing those models.

A Urge number of scientists were also needed in investigating the levels of radioactivity on 1,8 million(l) farms. A voluminous population registry was established. This contained data on four million people whose physical condition is under observation on a regular basis.

Various organisations made contributions to the WHO research. Between 1991 and 1995, the European Commission paid about US $ 30 million for 16 projects. Often the aim of these project was the transfer of technology for radiation measurements. Almost always, the technology transfer involved the education and training of people, mainly from the Ukraine, by experts from the European Union.

The WHO project is has been going on for two years now. Too short, says WHO, to get clear results. Many Russian researchers, who consider Chernobyl as " the most tragic accident in human civilisation", say that there "was never before a chance to conduct so much research on such a large scale". They want to continue the research because of this and also because, as N. Krysenco, Belarus' deputy-Minster of health, put it," we can expect a lot more consequences from Chernobyl".

What comes through is the fact that, health problems resulting from the accident are still increasing in the Ukraine, Belarus and Russia.

The people in radiation affected areas of Ukraine are more often ill — by 30 percent — than those in other parts of the country. Illnesses of the circulatory system have increased by 43 percent, bone and muscle illnesses by 62 percent, malignant tumours by 38 percent. Surprisingly, the report shows no increase in leukaemia.

One third of the liquidators from Russia, who had to work at Chernobyl after the catastrophe, are ill and cannot work anymore; two percent of them have died. A total of 800,000 liquidators from all parts of the Soviet Union were involved in the Chernobyl cleanup.

From the Editor's

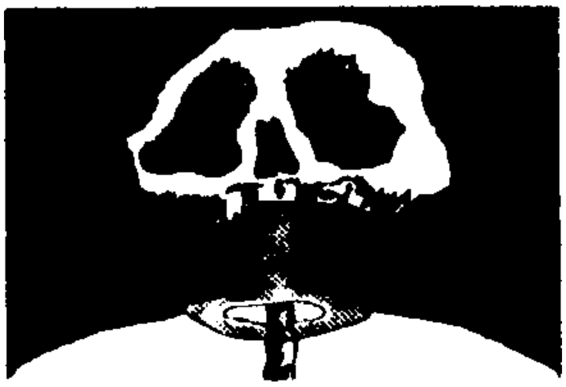
This is Anumukti's fiftieth issue. Originally we had planned to bring out something special—A history of the experience of nuclear power in India in cartoons, However, doing that properly takes time and we are already so late that we decided to bring out issues quickly and get back on schedule and then try out new time-consuming propositions.

Publication of Anumukti began on 6th August, 1987, with the statement: "Nuclear power is an idea whose bright future is already behind it." During the last nine years, the truth of this has become all the more apparent. Even nucleocrats have begun to realise the writing on the wall but the chains of private profit are stronger by far than any rudimentary cognizance of harm caused to society at large by their activities.

Normally it has been our practice not to have long articles. But we have made an exception this time since we believe the issue of radiation protection is best presented by putting up the various different arguments in all their detail. Dr. Rosalie Bertell in a speech at Hiroshima has done this in a masterly fashion. In this issue, we have articles from both Dr. Alice Stewart and Dr. Rosalie Bertell—two towering personalities whose pioneering work has done so much to elucidate the harm caused by so-called "acceptable" levels of radiation. They demonstrate the fallacies involved in the setting of standards for safe levels of radiation. It is another story altogether that even these unacceptable and unsafe international standards are still not followed in India !

On the one hand aid organisations helping the victims are finding it difficult to raise funds. It was estimated in 1991 that it would need US $ 647 million to provide effective help. The amounts raised thus far have fallen far short of this and it is becoming more and more difficult to raise new funds. In the absence of scientific proof that the health damages are indeed the result of the accident, donors say that they cannot provide money to address 'normal' health problems in the Ukraine. On the other hand, according to a senior expert of the World Health Organisation, it will take at least 20 more years before a scientific study can be conducted.

WISE News Communique 442,27 October 1995



Can Bhopal Ever Forget Chernobyl?

Bhopal was the turning point. Those eyes still haunt. But Bhopal was not merely what happened on the night of December 2 and the early morning of December 3, 1984. It is the abuse that still continues. The real disaster is the fact that corrupt people in power chose to associate with foreign peddlers of hazardous technologies and conspire against the interest and well being of theirfellow citizens.

Chernobyl is no different. Radiation community has defended its interest by denying the extent of death and suffering caused on the people involved whether they be children living in the vicinity or the 'liquidators'—a lot of whom were forced into 'volunteering' to contain the inferno.

The International Atomic Energy Agency is holding a Conference: "Once Decade after Chernobyl: Summing up of the Radiological Consequences of the Accident" in Vienna, Austria, 8-12 April 1996. Because we have watched the various attempts of the IAEA to minimise the radiological effects of Chernobyl over the past ten years, because the IAEA has a mandate from the United Nations to promote nuclear power and other nuclear technologies, and because ten years is insufficient time to allow for the development of most radiation related cancers, we believe that an independent international body, qualified to comment on the IAEA conclusions and to produce credible evidence to support its claims is a necessary international remedy for the potential damage which this IAEA Conference can cause. For these reasons we propose to hold a counter-conference in Vienna April 12-15, 1996 to undertake serious investigation of both the claims of the people most affected by the disaster, and those being attributed to the disaster by promoters of nuclear power.

The report of the Secretary General of the United Nations (Document of the General Assembly A/50/1995) specifically calls for the strengthening of international corporation and co-ordination of efforts to study, mitigate and minimise the consequences of Chernobyl disaster. In addition to the profound suffering of the people most directly affected by the disaster, there were serious violations of the human rights of the victims to understand what had happened to them and to receive assistance. There has been a remarkable imbalance in international responses to the disaster. Research activities designed to establish accurate scientific knowledge and assessment of radiation effects has often taken precedence over tangible financial and material assistance. Many nations have poured in money to map the radioactive fallout: create plans and mechanisms for possible future disasters of this nature which will take place elsewhere; develop practical means to deal with the economical consequences of contamination of food and land, and other activities basically designed to help the nuclearised areas to the world, not the disaster victims. These international players also are undertaking public relations damage exercise* so that people will tolerate the risks connected with further nuclear reactor proliferation.

Tribunal on the Consequences off the Chernobyl Disaster

Vienna, Austria,
April 12-15,1996

The victims have not only suffered from neglect, but they have also suffered from other people's denial of the reality of their experience. Mothers, concerned about the deterioration of the health of their children were told they had "radiophobia". Persons presenting at clinics with unusual illnesses which they believed resulted from their exposure were told that there would be no radiation effects for twenty years, and perhaps then they might develop a cancer. The denial of their experience was itself painful.

This mishandling of real health problems has worked directly against the pressing health and economic survival needs of the victims. The dispute over whether or not the observed severe problems of health, especially among the children, are attributable to radiation or to other factors, has deterred many nations from helping the 400,000 displaced persons and many other severely affected, survivors. All three nations close to the disaster have experienced declines in their GDP: Russian economy declined 16% in 1994 from its 1993 level; the Ukraine declined 25% over the same year; and Bylorussian economy declined by 20%. These declines follow several years of declines averaging between 14 and 17% per year. The impact of the necessity to meet the urgent medical requirements of liquidators, children, displaced persons and elderly, plus the need to redress Chernobyl's environmental and economical impacts, has devastated the shrinking economics. Belarus has had to devote 20% of its national budget expenses each year for the mitigation of Chernobyl consequences, Ukraine devotes 4% (although it maintains that it should be spending 20% at least) and Russia has maintained 1% of its national budget devoted to Chernobyl problems. The permanent contamination of much of their prime farm land further complicates the health, social and economic future of these countries. In the face of such monumental problems, trying to counteract the denials of their reality in the international circles which might have helped them had they known the truth, has become nearly impossible. It is time to bring international attention to their plight.

The secretary General of the United Nations states:

** The desire for hard evidence before action has left the victims of the Chernobyl disaster waiting nearly ten years, and mush inaction has hidden behind what will always remain unquantifiable".*

The IAEA has a vested interest to sec that radiation health damage remains forever unquantifiable, as this state of "unknowing" favours the expansion of the nuclear industries. We fear that the IAEA April 1996 meeting will further deter nations from helping the victims, and furthermore will be designed to promote nuclear technologies in the Developing Countries, assuring them that the Chernobyl problems are minor and not related to nuclear technology itself.

In response to this event, the International Medical Commission Chernobyl has been formed and has joined with the Permanent People's Tribunal to carry out the following purposes:

- 1 To provide for a fair and unbiased hearing of the concerns and evidence which have been gathered by our colleagues in Belarus, Ukraine and Russia relative to the radiological and non-radiological consequences of the Chernobyl disaster,
- 2 To provide for a fair and unbiased hearing of the concerns and evidence which has been gathered by our colleagues in Belarus, Ukraine and Russia relative to National and International responses to their needs for compassionate assistance after the disaster,

The International Medical Commission hopes to develop an international voice for honest and just dealing with those who have already been victimised so that they are not victimised again

- 3 To provide for a fair and unbiased hearing of the response of our colleagues in Belarus, Ukraine and Russia to the pronouncement of the April 1996 IAEA meeting, as well as to prior documents which IAEA has released on the disaster and its consequences,
- 4 To judge the medical the medical and scientific findings at Chernobyl relative to the experience of the people of Hiroshima and Nagasaki after the dropping of the atomic bombs,
- 5 To examine the limited recognition of radiation related injuries among the atomic bomb survivors in light of the failure to recognise radiation injuries after Chernobyl
- 6 To examine the Human Rights violations of the atomic bomb survivors and the patterns of Human Rights violations observed at Chernobyl.
- 7 To provide fair, unbiased and independent judgements to the United Nations, the media, governments and concerned persons on the violations of human rights, scientific integrity and honesty which the IMCC and the PPT will be able to identify as part of the national and international response to the Chernobyl disaster.

The International Medical Commission together with the Permanent Peoples Tribunal have been responsible for the evaluation of the aftermath of the Bhopal disaster, and have been the primary forces behind the development of International Law to provide remedies to victims of technological, industrial and medical disasters. By their distinguished panels of physicians, scientists and jurists, the IMCC and PPT hope to develop an international voice for honest and just dealing with those who have already been victimised so that they are not victimised again in the national and international responses to major disasters.

Dr. Rasalie Bertell

Tho Ruison d'etre

Why was "The Peaceful Atom" invented?

A Bomb with No Upper Limit

US military had six bombs at the end of World War II. Two were dropped on Japan, leaving four to be used in "tests" which they decided to conduct in the Pacific Islands. Testing at Bikini began in the summer of 1946, even before the United Nations had given the territory of Micronesia into the "protection" of the US as a Strategic Trust Territory. The Trust was not established until 1947, and it was only the UN ambassador from Australia who objected. The whole world knew that the US was already using the Atolls as a nuclear weapon testing range. The Australian Ambassador resigned, was replaced, and the vote taken in favour of US possession. The world looked the other way as the 32,000 people of the Marshalls were subjected to some 68 nuclear tests.

Atomic bombs had proved to be limited in size. In order to induce sustained nuclear fission, the chain reaction which produces all of the energy, the uranium 235 atoms need to be brought very close together so that the neutrons released in the splitting of one atom can reach other atoms and continue the splitting. In an explosion this fissionable material is blown apart and the reaction stops. The first hydrogen bomb explosion occurred in March of 1954 at the Bikini Atoll in the Marshall Islands. We, in North America, did not know what had happened to the Rongelap People and the other Marshallese. Nor did we really understand that this new hydrogen bomb provided the military with a bomb which had no upper limit in detonation power. The bomb was based on fusion rather than fission. In fusion, atoms are forced together rather than blown apart, and in the process they release an almost unlimited number of neutrons. The energy for fusion was produced by a fission detonation. The neutrons produced by the fusion were then absorbed into a blanket of fissionable atoms producing detonations in the megaton rather than the kiloton range.

The Peaceful Atom Programme

In the wake of the Bikini test, the military decided to change the whole arsenal to thermonuclear devices—hydrogen bombs. For this it required extensive uranium mining, a series of large production facilities to enrich the uranium, bomb production factories, and public tolerance of the waste from all parts of the cycle. They also needed the co-operation of society with the transportation of radioactive material, radioactive effluents from nuclear facilities and uranium support industries. The military needed co-operation from the universities in preparing nuclear engineers and physicists to staff its technical needs. All of this would be impossible during peacetime when the only purpose was producing weapons of mass destruction. They were already experiencing the rumbles of anger over the Nevada Nuclear Testing Site, established in 1951.

Shortly after the hydrogen bomb explosion in March of 1954, President Eisenhower made his Peaceful Atom speech in the United Nations, an people were told that this awesome energy was now tamed and could produce unlimited amounts of electrical energy. It would produce electricity too cheap to meter. It would instantly bring developing countries a modern standard of living. There would be no more war, because the whole world would have as much of the good things of life as they could ever desire. For a world just beginning to understand Hiroshima and Nagasaki, and the potential atomic megadeath, this promise of something wonderful for humanity arising out of the ashes was intoxicating. Academics, who abhorred the bomb began to study nuclear science. It became popular in schools. People became willing to mine uranium and to tolerate the effluents and waste. Nuclear engineers and physicists became like gods, and they were admired for the intelligence and their ability to attract government grants. They were superhumans, privy to secret of the gods which were totally beyond the understanding of most people. The peaceful atom myth was very successful in the public support, without which the build-up of nuclear weaponry would have been impossible. Most of the civilian enablers of this military addiction were completely unaware of their own roles. Even anti-war activists joined in.

The United Nations' response to Eisenhower's speech was to establish the International Atomic Energy Agency (IAEA). This new agency was given two mandates: to prevent the horizontal proliferation of nuclear weapons, and to promote peaceful uses of nuclear energy. It has no basic mandate to abolish nuclear weapons or to promote health and safety relative to nuclear technology. The IAEA is still busy trying to find medical, agricultural and commercial uses for nuclear energy. More recently, it has been promoting the image of nuclear power as a "safe, clean technology" by downplaying the radiological consequences of Chernobyl accident. This doubly victimises the people who lived near the reactor: first they were innocent victims of the disaster and now their illnesses and sufferings are being denied. I think the people of Hiroshima and Nagasaki or Bhopal can understand this injustice.

One of the physicians who served at the Bikini Atoll gave up the practice of medicine after he saw what the radiation effects were on the sailors sent into ground zero after the tests. All of the health damage was classified as secret, even from the men themselves.

Dr. Rasalie Bertell
from a talk delivered on the 50th anniversary of Hiroshima.

Possible Fallacies in Present Cancer Risk Estimates

Dr. Alice Stewart

Exposure to radiation is an occupational hazard for those working in the nuclear industry or in medical radiotherapy; it is well-known that radiation can induce cancer in tissues. But there is a widespread belief that my monitoring radiation exposure of workers and making sure exposure never exceeds a recommended annual 50 mSv dose-related cancer risks have been kept at near zero level.

For example, a study on occupational dose and subsequent cancer risk published in 1990 by the US Committee on Biological Effects of Ionizing Radiation (BEIR) indicated that even an annual dose of 10 mSv per year for 48 years—ten times higher than the average for all badge monitored workers at the Hanford nuclear facility in the US—the risk of cancer death would still only be 23% compared with a general population risk of 20%.

As a rule, risk estimates are derived not from occupational data but from epidemiological studies of Hiroshima and Nagasaki A-Bomb victims. Hanford became operational in 1944, time enough for some direct risk estimates to be made". However, this is deemed unnecessary since both BEIR and the International Commission for Radiological Protection (ICRP) are of the belief that the A-Bomb data and its interpretation by the Radiation Effects Research Foundation (RERF) offer reliable risk estimates for all occasions. This consensus has now lasted for thirty years and is now so strong that only risk estimates which conform with A-Bomb data are allowed to influence radiation safety regulations.

A-Bomb data collection and analysis left room for different conclusions to be drawn, conclusions sometimes contradictory. The original interpretation is subscribed to by the establishment, but may be flawed

Study subjects were assembled five years after the event and included those with inutero as well as post natal exposure. The then Atomic Bomb Casualty Commission — now RERF — took all survivors within a 2.5 km radius as 'cases' and the 'control' consisted of two groups, from greater distances, of the same size, age and sex composition as those cases under two kilometre.

Here then was the first mistake in data collection. By comparing matched samples which differed only in their distance from the hypocentre, ABCC failed to facilitate the easy interpretation of age at exposure related radiation effects. Given this less than perfect data base, subsequent mistakes, this time in data interpretation by RERF, exacerbate the problem.

RERF presumed an even spread of high to low doses across all ages of exposure. The evidence shows that high dose survivors were mainly young adults, suggesting some sort of survival of the fittest selective process by the high dose radiation. This theory is given added weight by the fact that the deaths before ten years of age of children of these surviving young adults was much smaller than the expected number.

RERF deduced no increase in non-cancer deaths as a result of the radiation. If the A-Bomb surviving population is compared to the controls, no significant differences are found in the rate of non-cancer deaths. There is a presumption here of two like-for-like populations being compared. However, it may be that the non-specific effects of the A-Bomb left a highly selected population which would be less likely than normal to suffer any kind of death at a particular age. If the radiation nevertheless caused bone-marrow damage in these survivors (a cell killing effect), this would have the effect of increasing their chances of later death (deaths from aplastic anaemia—a disease arising from bone marrowdestruction—were unusually common before 1950). Thus these two opposite effects of increased and simultaneously decreased chance of survival would cancel each other out, masking a real increased risk of non cancer deaths caused by radiation.

According to RERF, although the effects of foetal radiation include brain damage, young embryos were not affected Hence, a widespread assumption that until eight weeks of foetal age the human embryo is immune to any brain damage effects of radiation. This is despite the fact that there was a significant deficit of births *seven* to nine months after the bombing, suggesting that doses of radiation were sufficient to kill embryos.

Finally, a total absence of childhood leukaemias in children born after inutero exposure to the A-Bomb is in direct contradiction to the findings of the Oxford Survey of Childhood Cancers (OSCC) which found a positive association between foetal irradiation and childhood leukaemia. This difference was originally ascribed to faulty interpretation of the OSCC data relating to prenatal x-rays. But work by my colleague George Kneale has shown that the latent phase of childhood leukaemia is characterised by an increased infection susceptibility. Coupled with the above mentioned probable lethal A-Bomb radiation effects on young embryos this suggests that the difference *is* more likely due to prenatal and post-natal death of the Japanese children, before an age when childhood leukaemia would become apparent

An alternative analysis

ABCC had collated data on sustained acute injuries effected by the blast, but considered the resultant variables of little value in analysis. RERF released the data to Knealc and he carried out his own statistical tests. If those with the highest level of multiple acute injuries are considered as the closest possible approximation to the original population, i.e. the unselected population, then findings for this subset might give some insight into the selective process.

Acute injuries were categorised as burns, oropharyngeal lesions, purpura and epilation. Using injury as a variable, various additional findings were uncovered: a strong association between injuries and leukaemia; doses sufficient to have non-cancer effects were not confined to those with obvious injuries, supporting our theory that sustained injuries included bone-marrow loss, leading to aplastic anaemia; a disproportionately high number of very young and very old people were among those with multiple injuries, which could be interpreted to mean that these people, most close to death, had been selected against by the A-Bomb.

> *The radiation community is of the belief that the A-Bomb data offer reliable risk estimates for all occasions. This consensus has lasted for thirty years and is now so strong that only risk estimates which conform with A-Bomb data are allowed to influence radiation safety regulations.*

Potentially wrong risk estimates based on A-Bomb data may have consequences for recommended safe levels of worker exposure. Pooling of monitoring records of nuclear installation workers from three countries, the US, Canada and Britain, has resulted in no findings of any dose related cancer risk, according to researchers from the International Agency for Research on Cancer (IARC). The risk estimates agree with those from A-Bomb data. It has been noted, however, that the IARC researchers failed to appreciate that relations between exposure age and cancer risk are very different for workers and A-Bomb survivors, and they mistakenly assumed that the dosimetry standards within the nuclear industry arc sufficiently uniform to allow pooling of data from several facilities.

Work by Kneale et al has shown that if the data is disagregated and then analysed, evidence can be found of a cancer risk much greater than any A-Bomb estimate. Kneale has also shown that for workers in the US nuclear facilities the cancer risk increases progressively with age when exposed RERF has repeatedly shown from the A-Bomb data the exact opposite — that cancer risk was lower for those exposed at an age 50 years and over compared to those who were under 50 years at the time of bombing.

Clearly, application of A-Bomb data to very different sets of circumstances, flawed or not in its interpretation, is invalid

The supposition of no low dose radiation risk to early embryos, based on A-Bomb data interpretation, has obviously been influential in clinical practice. It is possible that the risk of foetal exposure has been dangerously underestimated, as evidenced by findings of the OSCC study.

Entrenched as it is in estimating cancer risk, A-Bomb data is showing no signs of being superseded in its use for setting safe exposure levels. It is still regarded as the gold standard. In its latest report, IARC makes no reference to the work of those proposing an alternative A-Bomb data interpretation.

Revisions of cancer risk estimations are bound to be sensitive, and no one wants to be alarmist. But if the nuclear industry persists in purporting its safety, surely there is an obligation for it to take on board the strong doubts as to the advisability of relying on A-Bomb data for the setting of safety limits for foetuses, young children and adults over 50 years of age.

Dr. Alia Stewart
Soft Energy 107,
December 1995—February 1996.

Trivialising Tricks

The Inside View from a Modern Believer in Human Sacrifice

Dr. Morris Rosen

Dr. Rosen, the author of this article is the director of the International Atomic Energy Agency (IAEA) Division of Nuclear Safety, and assistant director- general of the whole organisation. Some time ago, the French government in collaboration with IAEA organised a conference in Paris on "comprehending" radiation risks. The following is an extract from a speech Dr.Rosen made to the conference and shows very clearly the mindset which trivialises other people's suffering to sustains one's own high-flying lifestyle.

Comprehending radiation risks is a real and major problem confronting society today. Perhaps every professional working in this field has had experiences similar to one I will share with you. Frequently during my air travels, I enter into conversation with my neighbour — generally a well educated professional. In a few minutes he discovers that I am involved in nuclear safety and inevitably the conversation turns to questions about radiation and its health effects.

"What can you tell me about Hiroshima or about the vast environmental contamination caused by Chernobyl?" I begin my answers by explaining that as we speak we are being constantly bombarded by a broad range of radiation, not only from the cosmos but also from the food we are consuming. That seemingly new and troublesome point is followed by my comments explaining that the many victims of Hiroshima were not killed directly by radiation, but by the explosion and heat wave created from the nuclear detonation. Of the 80,000 survivors who received very high doses of radiation, less than 500 have incurred illnesses so far which are attributable to the radiation exposure - a statement that is also new and received with disbelief. But the figures are scientifically factual.

It is interesting to note that while (the average dose received by the Hiroshima survivors) is considered by Mr. Rosen to be very high, higher doses received by radiation workers are considered "acceptable and safe" by radiation experts like Mr. Rosen!

About 8000 survivors have indeed died from solid cancer tumours, but epidemiological studies indicate that less than 500 can be attributed to radiation effects. The remainder are normal tumours of the type that will threaten all of us, whether survivors of Hiroshima or not. It seems that most of us, even the professionals, do not realise or want to acknowledge that cancer is a very common occurrence. Twenty- five percent of us will incur a fatal cancer.

[What Rosen doesn't mention here is that radiation exposures produce an excess of so-called 'normal' cancers, not to mention other forms of dis-case and morbidity]

The answer to my neighbours second question concerning Chernobyl elicits the same disbelief. Certainly the fact that the entire environmental contamination of Chernobyl has produced a global radiological impact equivalent to an additional world exposure to 20 days of natural background radiation is more difficult to comprehend, let alone understand. The same is true of the health effects to the surrounding population which, except for the apparent, expected, and regrettable increase in thyroid cancer in children, will be sufficiently small so as not to be discernible through epidemiological studies.

[Especially radiological studies designed specifically not to pick up any excess in health effects like the IAEA conducted Chernobyl study which left out all the liquidators who were the people most at risk. It is also worthwhile to note that while Dr. Rosen how finds the 2500 % increase in thyroid cancers among children to be " apparent, expected and regrettable" he did not do so in 1986 when he wrote his first paper regarding the accident's consequences.

Why does my neighbour not believe me? [It would indeed need an extremely gullible neighbour who would!] Certainly, his perception of the facts is different from mine. Why? Many of us have been very pessimistic about our ability to deal with the public's perception of radiation risk. Radiation is mysterious; It is invisible, intangible, odourless, silent, and associated with warfare.

To explore this issue in more depth, the IAEA in October 1994 organised upon the invitation of France an International Conference on Radiation and Society: Comprehending Radiation Risk. It attracted more than 400 participants from 50 countries and nine international organisations.

The conference sought to bring about a better comprehension of the risk attributed to the exposure to ionising radiation. This is an important and serious subject for all of those concerned with the uses of atomic energy and ionising radiation for health applications, improving the food supply, generating electricity, and producing consumer and industrial products [vital items like radioactive golf balls from Atomic Energy of Canada Ltd, or radioactive black diamonds from our own Bhabha Atomic Research Centre].

The large audience—a unique mixture of technical specialists, social scientists, decision makers, and media professionals—was an indication of the high level of interest in radiation and how individuals and society perceive its effects. [It was also an indication of how avidly this class of people takes to free trips and hospitality at government expense!] The conferences goal was hot a further elaboration of technical information, but a better comprehension of radiation risk. And by comprehension, the conference had certainly desired to promote not only an understanding of the scientific facts of radiation health effects, but also and more importantly an ability to express these facts in a form useful to the public and the decision makers.

The goal was ambitious, perhaps too ambitious. The conference had only limited success in satisfactorily dealing with the question of the comprehension of radiation risk. Yet the concerned specialists may have gained some better insights as to where the roadblocks to better comprehension lie. There arc many.

Scientists too often speak to themselves and this pattern was very evident during many of the conference sessions. There could have been more efforts to present facts and conclusions in an understandable and communicative language. Some specific examples may be illuminating:

Dr. Rosen: Although the action of sharpened *steel* on the jugular does often regrettably result in death, just think you are the only case involved !

Victim: Hey! it is my life !

It would have been useful to further discuss the implications of some remarkable facts among the 80,000 survivors of Hiroshima. Fewer than 500 have so far incurred a fatal cancer attributable to radiation exposure- and the average loss of life expectancy among the survivors is about 1 year, while those that have incurred the fatal cancer have had their life cut short by 10 years.

[There arc a few other things Rosen could have mentioned here, including just what could he possibly mean by 'a fatal cancer attributable to radiation exposure' when it has surely been known for years that radiation exposure raises the probability of occurrence of all cancers, not simply those most attributable to radiation. In addition, it has been suggested that exposure to radiation increases the incidence of all diseases, 'radiation related' or not. The implications of the fact that radiation doses to Hiroshima survivors have in the past been overestimated, and that corrections to the dose received by them has resulted in considerable decreases in the quantity of radiation needed to increase the probability of a given health effect could also have been discussed, as could the fact that that more vulnerable people would have died quickly from blast and injury, leaving only the toughest to survive afterwards... indeed, all of these things, not mentioned by Rosen, could have been mentioned.

It would also have been desirable to discuss the reported thyroid nodule cases in the Marshall islands and in Nevada by not only confirming that large exposures to radioactive iodine produces cancer nodules, but by also referring to the rather relatively small number of cases involved (Sec Cartoon)

As for the Chernobyl studies, speaking about a 2500% increase in thyroid cancers in children ignores the importance of the accuracy of the pre- Chernobyl reference value for these studies, which surely involves major uncertainties. It would have added more to the comprehension of health effects to have expressed the results as five cancers per 100,000 children and to refer more precisely to the total number of cancers to be expected in the various regions. An unemotional discussion of the clinical outlook for these children would also have been useful.

[A little unemotional history would be of interest here. Before the

Chernobyl disaster there used to be barely one case a year of thyroid cancers in children in the Gomel region. After the disaster the number became 130. When doctors from Belarus reported this finding to the British scientific journal "Nature" it was denied publication because experts and scientists of the radiation community refused to believe "in the light of Hiroshima data" that so many thyroid cancers would become apparent so soon. However, the government of Belarus supported its doctors and asked for a team from the World Health Organisation to come and confirm the findings. It was only when this team did do so, that the results were allowed publication. By, now casting doubt on the reference value i.e. the number of cases occurring before the disaster, Dr. Rosen just wants to obfuscate matters. Also a statement like only five cancers per 100,000 children without simultaneously mentioning the 'normal' incidence of thyroid cancer is bound to mystify rather than clarify people's comprehension of radiation risks.]

There were a number of references to the cardiovascular effects of radiation. This effect must be clearly qualified by indicating the many compounding factors and the more likely cause, which is other factors such as stress.

[Indeed, stress is a factor in cardiovascular disease, as it is in cancer, and a number of other diseases. So also arc diet, the presence of carcinogens both chemical and radiation, and heredity. But Dr. Rosen seems to be trying to say that if stress is a factor, which it certainly is, then radiation cannot be—which is by no means true. Also there can be no doubt that a radiological disaster in the vicinity is bound to increase stress and it makes no difference to you whether you die or arc crippled by a heart attack that was "due" to radiation or due to stress induced by radiation.]

In the discussion of cancer clusters, such as leukaemia clusters, it is necessary to repeatedly emphasise that clusters always exist in nature. They have been found long before nuclear power existed and are also found in locations remote from nuclear installations - and in any case the number of excess cancers are few. Discussion of the Seascale cluster (reported in the 1980s in the United Kingdom) lingers on although most involved scientists believe it is not in any way connected with radiation. Why are the profound limitations of linking clusters to any cause not clearly and repeatedly stated? Furthermore, in much of the scientific community, epidemiology is recognised as an observational science with severe limitations. Epidemiological studies often involve small numbers of excess cancers with substantive compounding factors such that for most situations, positive as well as negative results must be taken with caution. The profound limitations of epidemiological studies must be clearly and repeatedly stated.

It's fair enough to call for humility and caution in interpreting a result. But the problem is that Dr Rosen will be much less humble and cautious when he thinks he has a result that exonerates radiation. The problem with the Seascale results seems to have been that the reported emissions of radiation from windscale/sellafield have been 'too small' to account for the observed effect under the official dose/response model, depending exactly which one we may use, as even the official model has seen very substantial downward revisions in the amount of radiation required to produce a given probability of a cancer, leukaemia, or other health effect. And if (as at Seascale) an unusually high incidence of a condition which even Dr Rosen recognises as 'radiation related' is happening in a community living next to a nuclear plant that is known to have leaked and to have had a very poor safety record, and if that incidence is especially high amongst children of plant workers who have been exposed to radiation as is the case at Seascale, then it really seems to be asking a lot of our credibility to say that the exposures arc 'not enough' to account for the result. It would really seem more probable either that more radiation has been released than we have been led to believe or that radiation is a much more potent agent of morbidity and mortality than we have been led to believe - or both.]

Rosen concludes:

The IAEA, together with the European commission and the World Health Organisation, has also organised a major international meeting in April 1996 to further look at the health and environmental consequences of the Chernobyl accident—10 years after the disaster. It is hoped that after the meeting, there will be a better comprehension of the radiological consequences of Chernobyl."

Indeed, one would hope this would be the result of such a meeting. Given the previous record of the IAEA in denying any real health effects at Chernobyl in spite of their grossest manifestations, and attributing the reports of vastly increased rates of not merely "radiation related' cancers , but dis-ease of all kinds to 'radiophobia', one cannot but wonder if this IAEA conference will be anything but a massively expensive exercise in whitewashing. A parallel alternative conference is also being held in Vienna and another in Kiev by the antinuclear movement just to ensure that an accurate picture has a chance to emerge.

M. Rosen Bulletin of International Atomic Energy Agency, Comments by John Hallam and Surendra Gadekar

The Rigmarole Regarding Radiation Protection

Do radiation safety standards protect health?

Dr. Rosalie Bertell

Originally, the US military thought that the radioactive fallout from their bomb tests would "only" spread over about half of the Northern Hemisphere. They found that the lethal cloud circled the earth about two and a half times. The three nations which had produced these bombs, US, UK and Canada had different radiation protection standards at the time, and they were afraid *of* some 'neutral' nation bringing a law-suit against them for the fallout The nuclear physicists from the three countries met between 1945 and 1950 to hammer out an agreement on "radiation protection" standards which could then be promoted globally. This committee of physicists was called the Tolerance Dose Panel, indicating a belief that people would be able to "tolerate" and adapt to increased radiation pollution in the nuclear age. The medical communities in both Britain and the United States were alarmed, and they organised two other investigating committees on radiation protection standards. In Britain, it was the National Radiation Protection Board (NRPB) funded by the government, and in the US a committee called BEIR - Biological Effects of Ionising Radiation, funded by the Rockefeller Foundation. The physicists decided that 15 rem (150 mSv) per year and 1.5 rem (15 mSv) per year for the general public was a reasonable trade-off between cancers likely to be caused by the exposure and the benefits of the activities which caused the exposure. At the time the "benefits" were atomic bombs. The NRPB and BEIR decided that 5 rem (50 mSv) per year for workers and 0.5 rem (5 mSv) per year for the general public was a more health protective alternative than that proposed by the physicists.

Radiation Dangers: Not a Novelty

Prior to 1950. radiation protection standards were based on protection against skin burns. It had been known since about 1912, however, that radiation also caused cancer. This became even more painfully apparent with the deaths of the deaths of the radium dial painters. In 1943, Hermann Muller received a Nobel Prize for showing that radiation caused genetic damage in fruit flies. During the 1945-50 period, several different biological endpoints were considered on which to base radiation protection standards: skin damage or other injuries, fatal tumours, general effects on blood, cataracts, obesity, impaired fertility, shortened life-span, or genetic effects. The committee decided to base the standards on fatal cancers, and since then the arguments have centred around just how many fatal cancers would be caused by exposure of the Standard Man to one rem (or equivalently 10 mSv) of whole body ionising radiation exposure. The carefully worded statement is: **What people should be concerried about after radiation exposure is fatal cancer." The* many other possible damages have faded into the background.

The International Commission for Radiological Protection

In 1928, radiologists had formed an international organisation to compare their experiences with exposure to medical X-rays and to protect themselves and their co-workers from harmful effects. In 1952, the Manhattan Project physicists who were trying to decide on common radiation protection standards approached this group of radiologists and suggested that they combine into one group. The physicists agreed to not ever limit medical use of radiation on patients, but only to set standards for worker exposure and exposure to the public from nuclear industries. They proposed their 15 rem limit but were ultimately prevailed upon by others to reduce this to 5 rem per year. The merger of these two group was called the International Commission of Radiological Protection (ICRP). ICRP now claims that it began in 1928, when the radiologists first organised, but that was a very different organisation.

ICRP is a self constituted organisation. Since 1952 it has maintained a membership of about 50% physicists and 50% medical doctors. The doctors have been about 25% medical administrators (often from nuclear weapon countries) who set radiation protection practices in their National Ministries of Health or Labour and about 15% medical radiologists. The other 10% has consisted of one pathologist, 2 geneticists and some biophysicists. By their rules, the Main Committee, responsible for all decision making, will not ever include an epidemiologist, occupational health specialist, public health specialist, oncologist or paediatrician. One can say that it consists only of users of radiation and administrators. These were approved by the Executive Committee of the International Radiologists Association at first, and then by the ICRP's own Executive Committee. Membership term is for an unlimited time. They have not mandated themselves to be protectors of worker or public health, but rather to recommend "sensible" trade-offs of health for the benefits of their activities.

By 1957 the ICRP got out its second publication, recommending that the internal radiation dose to workers and the public be limited to 5 rem (50 mSv) per year of any ingested or inhaled radio nuclides. The committee originally intended that this be a combined external plus internal dose limit of 5 rem (personal communication, Dr. Karl Z. Morgan, Chairperson of the Internal Dose Committee of ICRP). Actually, it was often interpreted to mean the worker could get both internal and external doses per year. There was another abuse related to internal contamination, i.e. when radionuclides were ingested or inhaled and became incorporated into bone. The nuclear experts counted only the 4 or 5% of total dose delivered the first year and then forget about the subsequent years. Slowly delivered doses due to bone incorporation could continue for 50 to 60 years.

ICRP Publication 2,1959 states:

"The permissible dose for an individual is that dose, accumulated over a long period of time or resulting from a single exposure, which, m the light of present knowledge carries a negligible probability of severe somatic or genetic injuries, furthermore, it is such a dose that any effects that ensure more frequently are ~~limited~~ to those of a minor nature that would not be considered unacceptable by the exposed individual or competent medical

It is important to note several things: First dose rate is not considered to be important; second only severe effects are prevented, and third, the probability of more frequently experienced effects is admitted but dismissed as *not unacceptable.* The recommendations are resting on several value judgements and not on objective norms protecting health. Effects of a *minor nature* include non-fatal cancers, embryonic and fatal loss, still birth and congenital malformations or diseases which are not inheritable.

The Debate Regarding Genetic Damage:

On 6 February 1947, Professor D. G. Catchside, member of the Faculty of Botany at Cambridge University, prepared a memo on: "the genetic effects of irradiation with reference to man", and sent it to the British Medical Research Council subcommittee on radiation protection standards. He testified that even the smallest dose of ionising radiation caused genetic effects. His own experiments included doses down to 0.1 rem (1 mSv) per day on mice. All genetic effects from X-ray or gamma rays were cumulative, either additive or proportional to total dose. Even when the dose rate was lowered, genetic effects were additive. He was concerned about the doses to human ova and sperm.

Catchside was answered by Dr. D. E. Lea in a memo to the Medical Research Council dated 28 April 1947.

"In writing this memorandum I assume members of the panel to be familiar with and accept the survey of Genetic Effects of Radiation prepared by D. G. Catchside." He suggests accepting the observations but not trying to prevent the problem since: It will not be possible to prove whether any particular instance was caused by radiation, so no question of liability for compensation can occur." Lea stated this twice, first with respect to deleterious effects caused by recessive gene mutations and second, with respect to semi-sterility. Lea concludes: "so long as less than 1% of the population is exposed to radiation then is not likely to be a noticeable increase in of hereditary abnormalities."

Apparently this dialogue was passed on to the Tolerance Dose Panel of nuclear physicists, because they held a meeting on genetic effects in April of 1948. No minutes are available from this closed meeting. Some members of the Tolerance Dose Panel went on to found the ICRP, and were members of the Main Committee when the question of genetic effects surfaced again in 1957.

Professor Catchside delivered a paper, "Genetic Effects of Radiation" at the Conference on the Biological Hazards of Ionising Radiation at Cambridge in 1950. He stated clearly:

"There is no threshold, no time factor (latency period) and no recovery".

"The genetic defects would consist in part of obvious and gross ones and in fart of the minor ones which tend to reduce the fitness of many apparently normal individuals. The latter effects may well be rather considerable and more important from the point of view of the species as a whole. The total effect may well be very serious or even disastrous.[39]

The same caution was echoed by Hermann Muller, who was by that time a member of the ICRP Main Committee. This position is detailed in: "Radiation and Heredity", American Journal of Public Health, Vol.54 No., pp 42-50, 1964, in an article which Muller published.

While both Catchside and Muller based their concerns on animal and plant studies, I had reached the same conclusions after studying the effects on medical diagnostic x-ray exposure. In the childhood leukaemia data, leukaemia was a late-death phenomenon. What I mean by this is that large numbers of embryonic and foetal deaths, neonatal or infant deaths also occurred in the infant group. The number *of* such deaths was significantly higher than the losses in the unexposed group. The final deaths in the birth cohort occurred after one year of age and were leukaemia (or other cancer) deaths up to age 15 years. I reported this in "Radiation Exposure and Human Species Survival", Environmental Health Review, Vo.25No.2(1981). My reasoning was that if medical x-ray during pregnancy was so lethal, it was very likely that many more babies who survived were damaged in some way. After exposure to a trauma capable of killing, it is unlikely that survivors had no residual problems. These were of course, hard to detect since there was no way of knowing the potential health of the offspring had they not been irradiated.

It was Professor K. Mather, Department of Genetics, University of Birmingham, UK, who answered the objection that there would be a "slow loss of fitness in the population" with chronic exposure to radiation. Mather takes courage in the "fact" that no more than 1% of the population would be exposed to radiation, but this was before the spread of nuclear technology and the fallout from nuclear testing programmes globally. He noted that:

"In particular, in human society, the fate of an individual is not independent of the activity of his fellows ... If his fellows take steps to alleviate his lot, his selective disadvantage will, at least in some cases, be reduced and bis contribution to the next generation increased... The point to be made clear is that, in the cast of man, discussion of the effect on the community of raising the mutation rate cannot be deponed from consideration of changes of possible with other species." In Biological Hazards of Atomic Energy, edited by A. Haddow, and published by Oxford Clarmdon Press in l952).

This is the old discredited argument of eugenics. In its more modern form, it advocates amniocentesis during pregnancy and abortion of genetically inferior offspring. This docs not change the reality of the damage to the human gene pool. It only kills the victims who are most easily identifiable. There will be many more who will not be identified for years after their birth. The genetic load of the species will increase, and as Einstein said in 1945: "we will have fewer geniuses".

The Importance of Kerala Studies

The Atomic Bomb data has been recognised for many years as being inappropriate for the study of genetic effects of radiation. The United States National Academy of Science Committee on the Biological Effects of Ionising Radiation (the BEIR Reports) normally uses mouse studies for their risk estimates, although their cancer estimates arc based on the Japanese data. BEIR III (1980) contains a section called "Advances in Knowledge Since 1972" (pages 74-79). In this section the committee says, with respect to genetic damage:

"We cannot ignore such mild mutations... taken over the whole period and in conjunction with other mutants, their effect may be far from negligible. Despite a concern fir this effect, we shall not attempt estimating it quantitatively..

"In contrast to somatic effects, where the concern is concentrated mainly on malignant disease, the genetic effects are on all kinds of conditions, for the spectrum of radiation-caused genetic disease is almost as wide as the spectrum of all other causes.[v]

Recently the BEIR Reports have used atomic bomb data to support their theory that humans have undetectable genetic damage from the atom bombs. As early as 1957, the World Health Organisation called together a Committee to study the genetic effects of radiation and to recommend protection of the human gene pool. In the publication by this Committee, Kerala, India, was identified as the best place to study the genetic effects of chronic radiation exposure over several generations. To date, the nuclear establishment has not undertaken a serious study of this population, indicating their lack of concern for genetic damage. In one study, undertaken for another purpose, the authors noted that the exposed population of Kerala had an abnormally high rate of Down's Syndrome. Researchers also found significantly higher levels of broken chromosomes in the exposed group. In 1988, with the help of Indian re-

searchers, I agreed to act as scientific advisor to a study of the people of Kerala. Researchers found that they were the first group to interview and examine the population, although the nuclear industry often uses Kerala as its example to "prove" that low level radiation is harmless.

We now have measurements of the background radiation at grid points all through the contaminated area, detailed information on about 32,000 exposed households and matched control households not living on contaminated sand, and information on 92,000 pregnancies. Our preliminary findings are that the rate of Down's Syndrome is 3 to 4 times higher in families living on the radioactive sand than for control families. Other problems which were more than doubled for the radiation exposed group were: congenital blindness and deafness, epilepsy, malformation of long bones, childlessness (couples who wanted to have children but could not), and various kinds of degrees of mental retardation. In the communities living on the contaminated soil every one of the so called sentinel mutations, rare genetic damage, was found This was not true for the matched controls. We are still trying to raise money to complete the detailed analysis of this important data.

In my opinion, all future radiation protection standards should be based on damage caused to future generations. This will significantly lower the limits of exposure which are now officially considered "safe". It has serious implications for further plans to expand the nuclear industry and for the management of nuclear waste.

HOW MANY DEATHS ARE "ACCEPTABLE"

In basing radiation protection recommendations on fatal cancers, the ICRP makes a decision on how many cancer deaths per year are "acceptable" for the activity (building nuclear bombs, generating nuclear power or caring for a patient with a radium implant). The fatal cancer risk is an estimate of how many cancer deaths are expected for an exposure to 10 thousand Person Rem, or equivalently, the exposure to 100 Person Sieverts. Prior to 1990, the official cancer estimates for this exposure were 1.25 (ICRP) or 1.00 (UNSCEAR - United Nations Scientific Committee on Atomic Radiation). I think that UNSCEAR merely rounded the numbers of the nearest digit.

There are also international guidelines for "safe industries", for example a chemical plant, which state that in a safe industry there will be no more than one death per ten thousand workers per year. A safe industry in a city is one which causes no more than one death per million people per year.

If one examines the ICRP recommendations for whole body exposure which govern the nuclear industry between 1952 and 1990, one finds that the maximum permissible dose to workers was 5 rem per year. If 10,000 workers annually receive that dose, the industry would cause 50,000 Person Rem exposure or five fatal cancers (using their risk numbers). Yet, they have never acknowledged this to be a hazardous industry. Instead, they claimed that workers only received an average of one rem per year not five rem, and therefore only one cancer death per 10,000 workers per year would be caused.

In 1990, the ICRP, after reassignment of doses to atomic bomb survivors and pressured by scientists and medical professionals globally, moved their risk estimate to 5 fatal cancers per 10,000 Person-Rem. This again makes the nuclear industry "hazardous on at one rem per year average exposure. It means that five fatal cancers are caused. The ICRP lowered its maximum permissible dose in 1990 to two rem per year, averaged over five years. Using their figures, this means a commitment to ten fatal cancers for nuclear workers per year is considered by ICRP to be "acceptable". Since 1984, the ICRP has admitted that its recommended exposure limits were: the upper limit above which everyone agrees that it is hazardous. Prior to that, the limit was considered a threshold below which exposures were considered safe.

The recommended maximum exposure for the members of the public at risk from nuclear industries was 0.5 rem per year in 1952. If one million people actually received this dose it would be 500,000 Person-Rem exposure. Using the ICRP risk estimate, this means 50 to 62.5 fatal cancers. This is a very unsafe standard even using ICRP calculations. The ICRP claimed that the maximum dose to the public was only one percent of that recommendation, hence the industry was "safe", but they would never lower this permissible dose. The one percent always referred to the reactor phase of the cycle (and was never demonstrated to be true when all radionuclides and all pathways to human were taken into consideration.) It was never claimed for uranium mining, milling or for nuclear waste.

In 1984, ICRP recommended that exposure to the public not average more than 0.1 rem per year. They did not specify the length of time this average was to extend Many governments, including Canada, averaged over the lifetime of the person (70 years) and thereby allowed higher per year levels around nuclear reactors only expected to operate for 35 to 40 years.

In 1990, the ICRP risk estimate was changed to 5 fatal cancers and the maximum dose to the public averaged over five years was recommended to not exceed 0.1 rem. This is a commitment to 100,000 Person-Rem or equivalently to 50 fatal cancers per year. This is a very hazardous industry even under the assumptions which ICRP deem "acceptable".

Fatal Cancer Risks Based on Scientific Literature

The ICRP risk estimate is based on a double reduction of the observed fatal cancer risk at Hiroshima and Nagasaki. Under the same standard conditions, 10,000 Person-Rem, Dr. Preston, Research Director of the RERF at Hiroshima, estimated that 17 fatal cancers were caused using direct linear extrapolation from high dose. According to Dr. Preston, UNSCEAR 1988 report reduced this estimate because of a low-dose-factor to 7 to 11 fatal cancers. ICRP took the estimates from BEIR (8 to 14) and UNSCEAR 1988 (7 to 11), which averaged about 10, and divided them by 2 using a slow-dose-factor. Hence, the ICRP estimate of 5 is really quite low even based on atomic bomb data. The reduction of the estimate for low dose and slow dose rate has never really been shown to be a valid process. In fact, the most recent studies of nuclear workers, who actually received low doses at slow dose rates, indicate that the correct estimate would be around 20.

With a risk of 20 fatalities due to radiation exposure of 10,000 Person-Rem the "acceptable" number of deaths per year at 2 rem average exposure for workers and 0.1 rem average exposure for members of the public would be

Workers: 10,000 workers x 2 rem / year x 20/10,000 Person Rem - 40 cancer deaths / year

General Public: 1 million people x 0.1 rem/year x 20 / 10,000 Person rem = 200 cancer deaths per year

This is of course quite different from the claims of the industry, and from "evidence" of poorly designed studies which the industry claims back its estimates. It should be remembered that these numbers arc radiation initiated fatal cancers which may take years to develop and to be diagnosed. By the time all of the cancers arc "seen" the nuclear facility will be moth-balled and the operators gone.

Annual Limits of lntake

The nuclear industry routinely emits radioactive chemicals into the air or water in the vicinity of a plant. It is difficult to regulate a mixture which is ever changing, so these radioactive chemicals are regulated one at a time as if the total permissible dose for the year was obtained from one radioactive chemical and via one pathway. Assuming that the Standard Man (a twenty year old Caucasian male in good health) has a standard breathing rate and inhalation and drinks a fixed amount of water every day, these estimates are converted into maximum permissible concentrations of the radioactive chemical in air or water. The concentration permitted would give the Standard Man the maximum permissible dose in one year. These number can be modified for Asians, for women or children, for various combinations of radioactive chemicals etc. These are the derived limits for cumulative releases from nuclear reactors. However, inhaled or ingested radioactive chemicals also pose special problems. They often arc dispersed differently in the body. For example radioactive iodine concentrates in the thyroid glass and cacsium in muscle.

Recently the ICRP has invented the Cumulative Effective Whole Body Dose, which accumulates the dose expected from the radioactive chemical over the next fifty years of the person's life the organs affected, and the whole body dose which would cause the same number of fatal cancers. This methodology seriously neglects non-fatal cancers. For example only 5% of thyroid cancers and less than 1% of skin cancers are considered fatal. These non-fatal cancers are allowed under the radiation protection schema.

For every 20 fatal cancers caused by radiation, about 10 non-fatal no-skin cancers and 20 skin cancers will be caused. It is certainly not clear that these non-fatal cancers should be ignored when "protecting" people from radiation!

This puts the nuclear industry in an even higher risk category when its permissible exposure levels are attained. It is assumed that 100 cancers will be caused per 10,000 workers per year, 40 of which are expected to be fatal. For the general public it means 500 cancers per million people per year, 200 of which arc expected to be fatal

As pointed out earlier, this does not include the other more frequent effects of exposure judged by the nuclear experts to be of no concern to people. These include autoimmune diseases and depressed cellular immune system. The latter leaves the person vulnerable to the more serious viral and bacterial infections and less able to cope with cancers caused by other factors.

A *New Approach to Radiation Research*

When the radiation exposure level is low, i.e. within an order of magnitude of natural background radiation, I believe that it is best understood as contributing to the effects of that background radiation. Over time the human body "ages". Ordinary diseases come more frequently and last longer. The ability to overcome fatigue and illness is lessened Cancers and autoimmune disease incidence rate increases. Not all of the characteristics of old age arc connected with background radiation, but certainly some arc. Chronological age is a good measure of cumulative background exposure to ionising radiation.

The acceleration of some of the components of ageing can explain a part of the problems experienced by those exposed to radiation, for example, the earlier occurrence of breast cancer in young women under age ten at the atomic bombings, and the adult illnesses observed in Chernobyl children. It can open new ways to understand the subtle chronic exposures which accumulate over a lifetime and finally lead to death because of our inability to deal with our environment. The natural process can apparently be accelerated by increasing radiation exposure levels.

Some phenomena arc not repeatable, and radiation exposure becomes redundant, or useless for producing that effect. An illness like adult onset diabetes for example, is an old age disease which one cannot acquire more than once. Therefore, one can expect lessening of the effect of radiation on ageing as the cumulative dose increases. However, at higher doses, direct damage to vital organs and direct induction of cancer can be expected to increase. I believe that there arc complicated and competing effects of radiation, the ageing effect being predominant at the low doses.

Can the ICRP be trusted to set radiation protection standards?

The obvious answer is no. I think that it is time to disassociate ourselves from this self-appointed recommending body. Firstly, it docs not have as its goal, protection of worker and public health. Rather, its goal is to recommend the "acceptable" trade-off of that health for the benefits of nuclear industries (medical, commercial and military) which it represents. In the fifty years since the formation of the ICRP it has never taken a stand on behalf of worker or public health, even against such obvious violations of human rights as non-ventilation of underground uranium mines and nuclear atmospheric testing.

It is also possible to fault the ICRP for its non-democratic structure. It is a self-appointed and self-perpetuating non-governmental organisation. Its behaviour does not follow that of usual scientific bodies.

The ICRP, moreover avoids all responsibility for its recommendations. It claims that it merely makes recommendations, which then become the responsibility of individual nations to either implement or modify as they see fit. However, it is evident that most nations lack the financial and scientific capacity to counter the unlimited resources and international prestige of the ICRP. Politicians and bureaucrats, with low scientific literacy, take the easy way out and adopt these international recommendations.

Subscription Information

Rs. 30/- per year (6 issues) (within India)
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/- Subscriptions, donations and enquiries regarding circulation should be addressed to:

Editor Anumukti
Sampoorna Kranti Vidyalaya
Vedchhi, 394 641 India
Tel: 02625-2074

Anumukti Team: Sumesh Chandran [Graphics], Sanghamtira and Surendra Gadekar

Published by S.Gadakar for Sampeerna Kranti vidyalaya and printed by him at The Parijat Prisetry, Ahmedabad.

PRINTED MATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 9 Number 3 December 1095 / January 1996

WORLD COURT DECLARES NUCLEAR WEAPONS' THREAT AND USE ILLEGAL

In a landmark decision on Monday, 8th of July, the International Court of Justice declared that the threat and use of nuclear weapons would be "contrary to the rules of international law applicable in armed conflict" in just about any imaginable circumstance.

The only exemption to this sweeping declaration of illegality was the court's holding that "in the view of the current state of international law and at the elements of fact at its disposal, the Court cannot conclude definitively whether the threat or use of nuclear weapons would be lawful or unlawful in extreme circumstances of self-defence, in which the very survival of the state would be at stake."

The single vote on these two provisions was seven to seven, with the president casting the deciding vote. However, since three of the dissenting judges did so because they took the complete illegality view and did not agree with the possible "extreme circumstance" exception, the vote for general illegality was, in effect, ten to four.

The court unanimously stressed that, in accordance with Article VI of the Nuclear Non-proliferation Treaty, "there exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control"

The Court was also unanimous that nuclear weapons, like any weapons, are subject to the law of armed conflict protecting civilians, combatants, the environment, neutral nations, and succeeding generations from the effects of warfere, as well as United Nations Charter prohibitions of threat or use offeree except in self-defence.

Peter Weiss, co-president of the International Association of Lawyers Against Nuclear Arms, welcomed the Court's opinion, stating, "This was an appropriate sequel to Wimbledon, with a group of unseeded states, carrying the day against the world's top seeds. The court has charted a clear path toward nuclear abolition, in terms both of its legal analysts and its appeal to start taking Article VI of the NPT seriously."

Commander Robert Green, Royal Navy (ret.), of World Court Project UK, said: "With this remarkable decision, I could never have used a nuclear weapon legally. This places a duty on the military to review their whole attitude toward nuclear weapons, which are now effectively in the same category as chemical and biological weapons."

In response to a request for the advisory opinion from the World Health Organization concerning the legality of use of nuclear weapons in view of their health and environmental consequences, the Court found that it has no jurisdiction because the legality of nuclear weapons is not within the scope of WHO activities. Ann Marie Janson, WHO liaison for International Physicians for the prevention of Nuclear War (IPPNW), commented that, This case was initiated by the WHO, with a boost from IPPNW, which understands that prevention is the only medical response to the threat of nuclear war. We are happy that the court referred to the need to protect the environment and future generations from nuclear damage in the General Assembly case, but we are disappointed that these same health aspects were understood only by the three dissenting judges in the WHO case."

The Court's opinion in the General Assembly case comes as a blow to the United States, United Kingdom, France and Russia, all of which urged the Court not to consider the case. The case was initiated by international peace and disarmament groups including the International Association of Lawyers Against Nuclear Arms (IALANA), International Peace Bureau (IPB) and International Physician! for the Prevention of Nuclear War (IPPNW). Not having direct access to the World Court, they successfully petitioned the World Health Assembly and the United Nations General Assembly to make requests for advisory opinions. Predrik Heffermehl of IPB stated, "This case is an encouraging example of the ability of people's organisations to make use of international institutions like the World Court, which are meant to serve the world's people and not their governments."

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From The Editor's

The Moral High Ground

Some people, just a very few, are moral. Many more are moralistic. To be sure some moral people are also moralistic. Being moral necessarily implies that one's conduct is governed by certain principles which one adheres to, even when, as they say, the going gets tough Being moralistic means that one demands moral conduct from others regardless of whether one is moral oneself or not.

Moral people are quite often exasperating to those around them. It can be annoying some times to adhere to a high moral standard expected of oneself especially when the outcome is likely to be not in one's immediate interest. And yet moral people however exasperating and however exacting their standards do command universal respect. Such a one was Gandhi. He was called many things in his life but even his most antagonistic adversaries respected him for his commitment to principles.

India, the nation which has officially enshrined Gandhi as the father of the nation, has preferred in its dealings with the world outside to be moralistic rather than moral. And whatever respect one may have for moral people, moralistic people with their sanctimonious lecturing are just a pain in the hind quarters.

Indian insistence on universal nuclear disarmament is a sound principle. But our advocacy of it would command respect if and only if we ourselves believed in nuclear disarmament and renounced in a legally binding way any intention of ever producing a nuclear weapon. This should not be too difficult. The World Court has already declared threat and use of nuclear weapons as illegal. For weapons which can never be detonated, nuclear weapons do cause tremendous destruction of the population whose supposed security is the cause of so-called cause of their production. The books we have reviewed in this issue bear ample testimony to prove this point.

Nuclear bramhacharya is not the abstinence of the weak. Like the real thing it does take some doing. But like bramhacharya supposed does, it too would confer unimagined power. It would allow the country to capture the moral high ground and lead an assault with rest of the world against the thuggery of nuclear powers and their international (dis)order. But those who have become used to scurrying around the nuclear high-table (security council) with their tongues almost touching the ground, hoping for an invitation or may be any odd crumb are not the ones to do it. The least they can do is stop being moralistic.

Surendre Gadtkar

Finding the Re-engineering of the Dome at Kaiga Too Difficult

DAE Re-engineers the Regulatory Board

L'Affair Gopalakrishman, in which the Department of Atomic Energy unceremoniously and shabbily remand Dr A Gopalakrishnan from the chairmanship of the Atomic Energy Regulatory Board, has keen too much in the news to require special coverage in Anumukti. On the next page we have an editorial assessment cf Dr Gopalakrishnan's tenure. The following is an edited version of an article of his where he describes the impasse which has stalled the construction of reactors as kaiga and Rawathbata.

On May 13. 1994, the under surface of the pre-stressed concrete dome in Unit-1 of the Kaiga nuclear power plant collapsed during the final stages of construction. The two 220 MW reactor units at kaiga and two similar units of the Rajasthan atomic power project (RAPP 3 and 4) which are all under construction, are to use the same dome design In view of this both the Nuclear Power Corporation (NPC) and the Atomic Energy Regulatory Board (AERB) urgently constituted separate failure investigation committees to go into the reasons for the Kaiga failure. Both these committees submitted their reports by May 1995. More than two years have passed since the dome collapsed, but till today the NPC and the Department of Atomic Energy (DAE) have not finalised even the design basis for the re-engineering, let alone a revised design. Construction of the containment structures at all the four reactor projects is at a halt.

The loss of electric power generation due to this delay at the Kaiga unit-1 and 2 alone will amount to Rs 800 crores so far. Similar loses at RAPP-3 and *4* can be estimated at about Rs 500 crores. These do not include the large additional interest expenses the DAE has incurred on borrowed capital. In addition, there is a multiplier effect through the loss of industrial production as a result of non-delivery of electric power to various parts of Karnataka and Rajasthan.

DAE
AERB
TRUST ME, I'LL SEE TO IT THAT HE BEHAVES PROPERLY
..OW..YOW...H...OW
..GR..R...
.GRR..

The New Watch-Dog

The AERB investigation committee which examined the causes of the Kaiga dome failure included some of the best experts in the country in the fields of pre-stressed concrete design/ construction methodology and quality assurance. They carried out extensive independent analysis of the dome, examined material test data and studied the voluminous inputs provided by all the concerned parlies before finalising their report. They reported the cause for the collapse based on analyses and corroborative evidence. The investigators have also stated the deficiencies in the design that eventually led to its failure. A set of indirect factors which point to the need for improvement, were also included in the report. The Atomic Energy Commission (AEC) discussed the investigation reports of the AERB and NPC committees in July 1995. They accepted the AERB report and directed the NPC to follow its recommendations while carrying out the re-engineering of the inner containment structure. Why, in spite of this directive given one year ago, should the impasse continue and the NPC be unable to proceed with the task?

Unfortunately, these findings of the AERB investigation on the Kaiga dome failure could not be disclosed to the media or the public because the DAE opposed such action, even though the report does not contain any information or data of a proprietary or secret nature.

On certain critical design aspects, the NPC is seeking deviations and concessions from the AERB beyond acceptable limits. While deviations could be allowed to a certain extent, it is incumbent on the designer to provide either analytical or experimental evidence to the regulatory body to prove that such departures will not have any adverse impact on the safety and integrity of the structure. NPC is yet to satisfy the AERB in this matter.

It appears that the re-engineering of a pre-stressed concrete dome with four large openings, to match an already constructed cylindrical wall with pre-fixed stressing cable locations, is becoming too complex a task for the NPC. This could be the reason why the NPC is considering various alternate concepts of dome design even at this stage.

Leaving matters to be decided

Whenever a major failure incident occurs, it is common practice to fix the responsibility for the failure, if detailed investigations provide a sufficient basis for doing so. Following the serious fire incident at the Narora Atomic Power Station Unit-1 in 1993 and the Kaiga dome failure in 1994, AERB investigation committees had submitted detailed

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Whenever a major failure incident occurs, it is common practice to fix the responsibility for the failure, if detailed investigations provide a sufficient basis for doing so. Following the serious fire incident at the Narora Atomic Power Station Unit-1 in 1993 and the Kaiga dome failure in 1994, AERB investigation committees had submitted detailed

reports on the causes of these incidents to the DAE. These included the omissions and commissions that could have contributed to their occurrence. But the DAE has so far not fixed any responsibility for these incidents, though the resulting economic loss in each case is more than few hundred crores of rupees. An essential step in building up a safety culture is to reward those who contribute to the enhancement of safety and extend just reprimands and penalties to those who have clearly neglected their safety responsibilities. Not doing this in the case of the Kaiga incident is also one cause of the present difficulties.

Dr. A. Gopalakrishnan
Former Chairman,
Atomic Energy Regulatory Board
Times of India July 25,1996

Dr. A Gopalakrishnan:

Dr. A Gopalakrishnan was not the first chairman of the Atomic Energy Regulatory Board Dr. A K De and Mr. S D Soman preceded him in that chair. Both these worthies knew very well that they held their offices at the pleasure of the chairman of Department of Atomic Energy. They therefore cut their sails accordingly. In fact, Mr Soman when asked to investigate certain wrongdoings in the Department of Atomic Energy, slunk away abroad for 'treatment' and then whiled away the little time left before retirement The least that can be said about Dr. Gopalakriahnan's tenure is that he did try to take the watchdog role of AERB seriously. The fact that two years after the thankfully unique collapse (sorry "delamination") of the containment dome at Kaiga, construction of the roof has still not got AERB's OK, is a tribute to Dr. Gopalakrishnan's sense of responsibility as well as his tenacity in standing up to DAE pressure. He also deserves praise for proceeding with regulation of X-ray units whose unregulated proliferation does constitute a great health hazard His performance after the fire at Narora in 1993 when he forced stoppage at other nuclear power plants to check if they too suffered from the same fault, was also exemplary and it did come up with faults in the turbine blades at Madras which prevented similar fires there and in other places. He deserves the nation's thanks for having tried to regulate with extremely limited powers of his office, the monster created in the name of nuclear power.

Having said all this, it must be added that the most that can be said of Dr. Gopalakrishnan is that he tried. There can be no doubts regarding his failure. The acrimonious manner of his departure just shows that nucleocrats remain as smug and self satisfied as ever and the danger to common people from their activities is as great as ever. They are likely to brush aside the Gopalakrishnan years as an unhappy episode when their misdeeds were sometimes exposed to the public gaze. They are also likely to be extra careful in future appointments of members of AERB. Thus, the impact of Dr. Gopalakrishnan's tenure over the long run is likely to be negative. The blame for this lies not only with the nuclear establishment but also to some extent with Dr. Gopalakrishnan himself. He did not (probably by choice) and while he had the opportunity, make changes in institutional procedures which would have ensured continued openness and accountability at least in the AERB. His successor in a press conference has had the cheek to say that, "If I am saying that we are making progress, you have got to believe me." Dr Gopalakrishnan's claim that " he believed in keeping the public informed about nuclear safety matters to instill confidence in the transparaency of operation" now rings hollow. A person more committed to openness and transparency and less obsessed with personal self-promotion could have, even with limited powers, left a better legacy.

Germans Say No to Nuclear Waste Dump

Wendland is a nose shaped region of Lower Saxony that juts out in what used to be East Germany. In the days before the reunification of Germany, West German nucleocrats thought it to be an ideal place for storing nuclear waste. The region was sparsely populated, not industrially 'developed' and hence by definition 'poor'. In case of accidents or leaks, the consequences would be borne by their 'brothers' across the border. Thus, it satisfied all the time honoured criteria of nuclear operations: to find a weak and defenceless population which cannot protest, and 'develop' it into the modern age. But as Burns said it so well- "The best laid plans of men and men.," With no consideration for the consequences, the Soviet empire collapsed and the always hoped for day of German unification arrived in the lifetime of those who had, whatever the hopes and the rhetoric, never expected ii to happen. From being in a remote region in the forests in a corner of the country, Gorleben (the village where the waste repository is located) in now right in the middle, easily accessible from all sides. This backward' rural region is quite satisfied with itself and does not care for nuclear 'progress'. Each and every farmhouse in the region has the sign CastorNIX painted on it. Last year when the first Castor arrived carrying its load of nuclear waste, the authorities found that all the villages in the regions had repainted their names as Gorleben. This caused a great confusion in police who were unfamiliar with the region.

Castor and Pollux -the heavenly twins-are two legendary Greek brothers, who were inseparable. They had a fight in which Castor being human died while Pollux who was the son on Zeus the king of the gods, survived. On being offered immortality, he refused if Castor was to have no part of it. The final solution was that they lived half the time in heaven and the other half in hell. Why, the container is called Castor is obscure to me. Perhaps it has to do with the fact that the container is of a modular design which fits in with another part-the Pollux-which can be lowered into the earth. Or may be nucleocrats (who live in a heaven of their own) have inadvertently hit upon the truth: In a new twist to the old tale, a few live in heaven whereas there is hell on earth due to nuclear waste! The following two reports describe the resistance to the May 8,1996 movement of nuclear waste shipment from Le Haugue in Prance to Gorleben in Northern Germany. 19,000 policemen were deployed from all over the country to in order to ensure the shipment reached its destination.

After the first Castor shipment last year those expecting the resistance to decrease found they were mistaken. Not only in Wendland itself but also all along the transport route the resistance has increased since last year. Another shipment was due to come this year from the nuclear power station at Gundremmingen in southern Germany but this was cancelled, apparently because the police did not think they would be able to "protect" it.

The Castor train carrying the high-level radioactive waste left the French reprocessing facility at Le Hague on its to Gorleben sometime in the evening of May 6. It had already been decided by groups campaigning against the shipment in Germany that there should be no obstruction of the train at the Franco-German border, in order to avoid giving any wrong nationalistic signals.

Soon after crossing the border, the Castor encountered its first resislance-a camp set up across a level crossing in W6rth. The police had to clear the tracks before the train could proceed.

As the Castor train made its way across Germany it symbolised the nature of nuclear state, with an advance party of police and engineers making preparations to clear the route ahead, at least three police helicopters flying in formation in front of the transport, and finally the transport itself, heavily guarded on all sides. Level crossings were closed 15 minutes before the arrival of the train, and police were monitoring all the bridges and level crossings along the route. It was like a military operation through hostile territory.

Despite the police presence, people managed to get onto the tracks in a number of places. In Darmstadt, Minden, Altenbeben and Gottingen, the train was blockaded There where actions in many other cities, not, even on the route of the Castor- Landau, Mainz, Bingen, Erlangen, Marlberg, Tri , Konblez, Sprenkling, Verden, Bielefeld, Bad Hersfelu, Bochum, Bonn, Dusseldorf, Dulsberg, Koln..

Dannenberg: End of the Line

Dannenberg is the end of the train line where each Castor must be lifted by a huge train on to a low loader lorry for the final stretch by road to Gorleben. Despite the banning of demonstrations there, 10,000 people held a rally in the town centre on May 4. They then marched to the main street and blocked it creating the slogan "Wir stellen uns quer" (We are blocking your path) by forming giant letters out of groups of people on the street.

On Tuesday, 6th May, 1800 peopre repeatedly blockaded the low-loader as it was being prepared for the journey. The police became very brutal with the demonstrators who included local farmers blocking the route with their tractors. The next day police took pre-emptive action against tractor blockading by vandalising 150 tractors that were packed in a nearby forest. Windows were broken and tires slashed.

Day X2: Military Tactics Force the Waste Through

Castor was due to arrive in Dannenberg at 4.00 AM on 8th May. However, a small group of demonstrators managed to hold the train for half an hour just outside the town. When it finally arrived, there were four thousand people waiting for it near the loading crane. What followed then was a forcing through of the Castor with water canon and riot police. (See Next Story)

Andreas Speck
Peace News June 1996

Wir Stellen Uns Quer (We put Ourselves on the line)

2.30 AM the Castor train reached Uelzen, lower Saxony. We try to reach the tracks, but the police stand shoulder to shoulder in riot clothing, equipped with shields and long truncheons. Their lines are impenetrable. Several water canons and ready and a helicopter circles overhead, accompanying the shipment.

The Castor sets of along the tracks-used only for Castor shipments—towards Dannenberg. Each brige and railway crossing is *guard*ed by police. In the flat open land near Dannenberg the headlamps of the convoys of the police vans rush through the darkness towards Dannenberg or Gorleben. Above, a helicopter circles with a powerful searchlight.

longer possible to prevent the storage of the second Castor in the above ground building which is designed to contain the planned 420 Castors. Nonetheless, we will do our utmost to increase the costs of the transport.

At 5.56 AM the Castor arrives in Dannenberg. It is lifted by a crane onto a waiting lorry. The 18 km road journey from Dannenberg to Gorleben begins. Thirty police vans, six water cannons, and several bulldozers precede the Castor while three thousand police accompany it. Those officers next to the Castor have to swap positions with others every ten minutes since in this short period of time they will receive their annual legal dose of radiation. Female police officers are not il lowed near the Castor for fear of damage to their progeny

Half a kilometre on, at the crossing first blockade, thousands of protesers watch as straw boles which have been set alight are extinguished with water cannons and pushed aside with bulldozers. Over a thousand people huddle together on the road; the Greens from the Lower Saxony government are also here. People turn their backs on the approaching water cannons and bow their heads.

Rows of police precede the water cannons, duck as they shoot water at the protesters, then run to beat the protesters off the road with truncheons over a metre long.

Panic breaks out, people scream and run away; some are chased and beaten. A Green politician's mouth is stuffed with sand by the police as she cries out for help. 30 people are badly injured; one woman, suffered a fractured skull, though it is not clear if this is the result of a truncheon or a atone thrown by a protester.

From the adjacent fields people have begun throwing stones and bottles at the police. Twenty police officers are slightly injured. Once the road is finally cleared of protesters, the convoy inches forward. The protesters cut across fields to overtake the convoy which is moving at snails pace. Along the road people erect barricades of dead trees pulled out of the adjacent forest, and set straw bales alight. Ahead on the road police prevent tractors from blockading the road. They smash the tractor windows, slash their tyres and break of the valves to let the air out. Fifteen farmers are beaten up; two were taken to the hospital.

It takes over six hours for the convoy to travel the 18 kilometres to Gorleben. In front of the Gorleben intermediate Storage Plant is another blockade of 300 people who are carried away to clear the road which is then cordoned off. We are treated more politely since they know that it will take at least another hour before the Castor arrives. Once they have cleared the road the police stand shoulder to shoulder behind riot shields. Behind them are the dogs.

At 1.07 PM the Castor arrives into the Storage Plant, accompanied by six helicopters circling overhead. Thousands of people stand in the woods and watch as the convoy passes. Some cry, others whistle or hurl abuse, others are too stunned to say anything. The second Castor has made it to Gorleben-at a cost to the state of DM 55 million. It is an expensive business but the government remains firm. It expects the protest to diminish but at the moment this seems unlikely. During the first Castor transport, 3.000 people came out on the streets in protest, and (14,000 police); this year there were over 6,000. Instead of diminishing resistance the shipment has radicalised many people.

Gisela Renolds, Wustraw, Wendland
Peace News June 1966

Russian Repression

Alexander Nikitin is the person responsible for detailing the criminal abuse of the North Sea by the Russian Navy by large scale dumping of nuclear waste. The Russian Government does not deny the truth of what Nikitin says. It just wants to gag him and others like him. He was arrested on February 6 and charged with espionage.

On June 10, 1996 Nikitin was denied bail, and his trial was handed over from a civilian to a military court. Nikitin, a former naval captain, has been held in a St Petersburg jail by the Federal Security Service (FSB - the former KGB). He faces a minimum ten-year sentence, and a maximum penalty of death.

Neither Nikitin nor his lawyer, well-known civil liberties advocate Yury Schmidt, was allowed to attend the June 10 hearing on the case. The hearing took the form of a closed-door submission by an FSB prosecutor to a civilian judge. As a researcher for the Norwegian environmental group the Bellona Foundation, Nikitin helped prepare a report on radioactive contamination of the environment by the Russian Navy's Northern Fleet. Naval authorities allege that Nikitin divulged secret information to Bellona. However, the jailed activist and his supporters insist that all the information contained in the report was freely available from non-classified sources. Bellona's report, which was eventually released on April 19, painted a horrifying picture of neglect by the Northern Fleet of nuclear waste security.

In an interview published by the Moscow daily Izvesliya on June 8, Schmidt charged that the way was being prepared for gross violations of his client's rights. A military trial would "not exclude the possibility of the case being heard in a biased, bureaucratic manner,"

The navy experts who prepared materials for the prosecution did so, Schmidt told Izvestiya, not on the basis of the Russian constitution or the recently-adopted Law on State Secrets, but of "old orders from the Defence Minister which contradict the constitution and the law "

The basis of the charges against Nikitin, Schmidt continued, lay in events from 30 to 35 years back. But the Law on State Secrets stales that the maximum length of time for which material can be classified as secret is 30 years.

Meanwhile, one document cited by the navy experts as containing "top secret information" proved to be an abridged version of an Izvestiya article from March 1995. Bellona activists say that attempts to submit their sources as evidence in the investigation have been refused. In sum, Schmidt told Izvestiya, the only "secret" he had encountered in the case was the passionate wish of the armed forces to hide the catastrophic situation in the area of nuclear safety, compounded by the desire of the FSB to prove its usefulness.

The desperate blundering of the military and security authorities should not, of course lead one to underestimate their seriousness in wanting to rid the country of environmental whistie-blowers.

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Testing, Testing, 4, 3, 2, 1...

The first nuclear test took place at Alamogordo in Nevada US, on Julyl6 1945. The latest on June 8, 1996 conducted by China at Lop Noon In between, at least 2045 nuclear explosions have been carried out by the US, Russia, Great Britain, France, China and India.

As of 1994, the number of tests stood at 2036, of which the US had done 1030, the USSR had done 715, France had done 192, the UK 45 and China 41. Since then, China has continued to test at an increased rate, and France has conducted six tests, bringing the total to approximately 2045 tests. The numbers are in fact a lower bound since although these nations are not ashamed to test they are sometimes reluctant to reveal that they have tested. The 'peak year' for testing was 1962, with 96 US tests and 44 Soviet tests. The largest nuclear test ever was carried out by the Soviet Union in 1961. It was a massive 58megatons, four times the size of the largest US test, of 15Mt.

Besides the official nuclear powers, the Indians have carried out a 'peaceful nuclear explosion' in 1974. A possible nuclear explosion that may have been either South African or Israeli has been detected by spy satellite in the South Atlantic, and the Pakistanis, the Israelis, and the South Africans are known to possess nuclear weapons which they may have not found it necessary to actually test. The Israelis are assumed to possess about 200 warheads, and the Pakistanis an unspecified number, though a French journalist puts it at 15-20, with 80 for India. South Africa has admitted to having 7-8 warheads, which it now says it has completely dismantled.

Recent press reports say however, that as many as 1000 nuclear artillery shells are still possessed by South Africa, and that some of this may have fallen into the hands of white extremists. It is hard to judge just how much of this is true, and the SA government has insisted that it has dismantled all its weapons, but it is possible that some part has not been dismantled as stated

Other 'would be' nuclear powers include Iraq, which conducted an ambitious weapons program that included the development of both plutonium and uranium weapons. Another was North Korea, whose program of gas-graphite reactors coupled with a large reprocessing capability seemed to be tailor-made for plutonium production for weapons purposes. Neither Iraq nor North Korea seem to have quite mastered the arcane art of weapons design however, though it seems likely that they would have done so given the time.

Questions have also been asked about the nuclear intentions of both Argentina and Brazil, both dominated for years by military regimes and neither of whom have signed the NPT. Both countries have ambitious nuclear programs, and both posses secret, unsafe* guarded reprocessing and enrichment facilities. Both however, in recent years, have exhibited some willingness to open up their nuclear programs to mutual inspection and to the IAEA

US Testing

The first ever nuclear explosion by anyone was carried out at the 'trinity' test site in New Mexico from a device suspended from a tower on Julyl6 1945, and was the culmination of the largest secret industrial R&D effort ever, namely the Manhattan Project, involving construction of nuclear reactors, enrichment plants, reprocessing plants and design and research facilities on an unprecedented scale.

Since then, the US has exploded 1,030 weapons and triggers for weapons of a variety of types and range of sizes with the most recent test happening on Sept23 1992, since when an effective moratorium has applied. Of these, 215 tests have been carried out above ground, and 815 underground.

US tests have included 5 underwater tests, 55 bombs dropped from aircraft, 56 exploded from towers, 36 from barges moored in shallow water, 28 on the surface of the ground or sea (which creates the maximum fallout) 40 exploded from balloons or rockets, and up to 1980, 465 exploded underground in shafts or tunnels. Of all these tests, 935 have been carried out in Nevada from 1945-1994, 43 at Eniwetok atoll, 30 at Christmas island, including a number of joint Uk-US tests, 23 at Bikini Atoll, 12 at Johnston Island, 3 in Alaska, and 3 in New Mexico.

The test program started relatively slowly, with three 'tests' in 1945 (two of them on Hiroshima and Nagasaki), two in 1946, none in 1947, 3 in 1948 including the ones at Eniwetok, none in 1949 or 1950, rising to 16 in 1951, 77 in 1958, none in 1959 or 1960 when a brief moratorium was in effect, and a frenzy of 98 atmospheric tests in 1962 just before the signing of the partial test-ban treaty in 1963. The US has also revealed a number of unannounced tests.

Russian Testing

Since 1949, the USSR has conducted 715 nuclear tests (compared to the US's 1030) with the Erst on August29th 1949. and the most recent in October 1990. Of these tests, 508 have been underground, and 207 atmospheric These teats have been conducted either at the Semipalatinsk 'polygon' site, or on the island of Novya Zemlya, in the Russian north, beyond the arctic circle. 496 tests have been carried out in Kazakhstan, 132 at Novaya Zemlya, 2 in the Ukraine, 2 in Uzbekistan, and 1 in Turkmenistan. 81 'peaceful nuclear explosions' have been carried out in Russia, and 26 in Kazakhstan.

Russia has exploded a total of 257megatons in the atmosphere, out of a global total of 438megatons, of which 141 was exploded by the US, and 22 by China.

The first Soviet thermonuclear or fusion device was tested in August 12 1953. a year after the US test of the 'mike' device at Bikini. It was a 'single- stage boosted fission' device (ie a device in which a fission reaction was 'boosted' by a surrounding layer of lithium6 deuteride), with a 200-300kiloton yeild. Later on in 1954, the idea of using radiation compression to compress and ignite a physically separate thermonuclear secondary was arrived at, and such a device was tested in November 1955. The largest thermonuclear device ever was tested by the USSR in 1961 above ground, at Novaya Zemlya. The Soviets also conducted the largest ever underground test, of 3.5megatons. The largest ever US atmospheric explosion was 15 mega tons.

UK Testing

The UK exploded its first nuclear 'device' on Oct3 1952 on an island off the west coast of western Australia. Subsequent UK tests were conducted at Maralinga and Emu Field in the desert of South Australia. Other tests were carried out at Christmas island, first by the UK alone and then in cooperation with the US. Subsequent tests have been carried out at the Nevada test site.

Secrecey and Deception

The public has tolerated nuclearism because it has been kept in ignorance and de/iberately deceived. Every government with a nuclear establishment has persued similar policies. The U.S. government for example, even deceived the public about the very detectability of underground nuclear explosions. In September 1957, after the first underground test in the Nevada flats, the government claimed that the explosion could not be derected beyond 250 miles. The deception was exposed by an investigative journalist who found that seismic stations as far away as Fairbanks, Alaska some 3,000 miles away had detected the shock.

Meanwhile, it has turned out that the UK just like the US, exposed servicemen (mainly Australians) to radiation, and has left plutonium scattered over the Australian desert, necessitating a costly cleanup program for which the Australian government has attempted to bill the UK government, which has refused to pay, causing a considerable ~~wors~~ening in the normally cosy UK-Australian relationship.

The UK chose, with Australian connivance, to test its weapons in the Australian desert because 'nobody lived there. Australian aborigines did in fact both live and hunt there, and a group of them wandered through the fallout area. No attempt was made to warn them of any danger. No record is kept of what happened to them.

The UK has conducted 45 tests to date, of which the most recent have been conducted at the US test site in Nevada. The UK is therefore affected directly by any US testing moratorium, though it has not formally agreed to US announced __ moratoria. The most recent UK test was on Nov24 1991. The UK, like France until very recently, favours a 100-500Kt 'threshold' for nuclear testing, rather than a zero threshold, a position in which il has been sustained by the US Pentagon.

French Testing

France entered the nuclear race in Febuary 1960, with a series of four above-ground tests in what was then French Algeria.

France was forced to shift its test site to Muroroa and Fangataufa atolls in the South Pacific, when it was found that Algeria was too close for comfort, since shifting winds could bring the fallout over France itself. When the 1963 partial test ban treaty and the 1970 NPT were signed, France refused to sign either, and like China, continued to test above ground • (or above the sea in this case) • at Muroroa and Fangataufa until it was forced by a case bought by Australia and New Zealand to the World Court, to bow to global public opinion in 1975, and take its testing program underground

France has conducted 204 tests to date, of these, about 180 have been in the Pacific at Muroroa and Fangataufa.

France has insisted that its testing program at Muroroa hurts no-one, and that environmental effects on the coral atoll are minimal or nonexistent. However, it has been forced to shift the testing of larger weapons from Muroroa to Fangataufa to limit damage to Muroroa, and there is evidence that considerable damage has in fact been done, both by previous programs of above surface testing, and by the current program of below ground testing.

Atmospheric tests conducted by France from the mid 1960s to 1975 have released most of their radioactivity directly to the atmosphere and the ocean, and have resulted in significant contamination. Hundreds of kilograms of plutonium and fission products have been scattered over the ocean floor. In addition, large quantities of waste have been left: contaminated earth, waste from decontaminating equipment, contaminated clothes, etc.

A map published in Le Monde on Oct 3, 1995 shows severe fracturing of the ocean floor at Muroroa. The French government says the map is "Greenpeace propaganda' and is a forgery."

Scientific missions have been given limited access to Muroroa. Though allowed to take only limited samples, have all detected radioactive iodine, cesium-134, and plutonium, both in the lagoon and outside the 12-mile exclusion zone.

Underground testing involves exploding the device or warhead at the bottom of a borehole about 1000m deep. The explosion vaporizes rock in its immediate vicinity, creating a cavity in which most fission - products are deposited inside the cavity. French authorities claim that they are vitrified in the melted and vuporized rock of the cavity when that cools, and that absolutely none can enter the wider environment. However, extensive Assuring takes place in a radiating pattern from the cavity, and the floor of the atoll is also extensively fissured. Ocean water circulates freely through the fissures.

France has observed a moratorium on testing from 15 July 1991, to September 4th 1995, when the last test series commenced President Chirac said that this series of tests was designed to assure the 'safety' of French warheads, but it looks rather as if the purpose was to finish the development of the TN75 warhead, and to continue the development of other warheads, as well as to develop a simulation capability which would enable warhead development even without testing.

The Sept 7,1995 test at Muroroa, of 20Kt, was for the TN-75 warhead. The TN-75 is a warhead with stealth characteristics, significantly more sophisticated than anything France now has, and is in effect a new warhead.

The last French test was a 120 kiloton blast carried out on Jan27th 1996 at Fangataufa Atholl.

France now says that from 1997, tests will be simulated in the 'laboratory[1], and through computer programs.

The French 'laboratory' consists of an enourmous complex under the control of the CEA's Division des Applications Militaires (DAM), in the south of France. The installation, called CESTA (Centre d' Etudes Scienifiques et Techniqes d' Aquitaine), containes 240 massive lasers of 30Mw each. The laser installation will it seems, have a dual role: the investigation of fusion phenomena for the development of fusion power, and the study of thermonuclear explosions. However, it will not be useful for the study of fission explosions, for which hydronuclear testing facilities and hydrodynamic testing facilities similar to the US's DAHRT facility will be required

Chinese Testing

China conducted its first nuclear test in May 1964, and its 43th test on May 15th 1995, a bare three days after the NPT Review and Extension conference decided to extend the nuclear nonproliferation treaty. Another test was carried out on Aug 17th. The May 15th test was of 40-50Kt, while the Aug17 test was around 60-70Kt. While the Mayl5th Chinese test passed with only pro-forma expressions of regret from the international community, the August 17th test was marked by vigorous protests sparked in part by concern over French testing. The author was the organizer of one such demonstration outside the Chinese consulate in Sydney, Australia.

Of these 44 tests, 23 have been atmospheric, and 21 underground. China conducted the world's last atmospheric test, in 1980.

China had been part of an agreement between the five nuclear powers to exercise 'utmost restraint' in the period leading up to the planned signing of a comprehensive test ban treaty(CTBT) in 1996.

While France and the US have now agreed to back a 'zero threshold' CTBT, which means in effect that no mini-nuclear tests are permitted, China has held out for either a relatively large 'threshold', or for the permitting of 'peaceful nuclear explosions', a formula which seems also to have some following in Russia, too.

Chinese nuclear testing has been carried out at the Lop Nor nuclear test site about 265Km southeast of Urumchi, the capital of Sinkiang. China has carried out a nuclear teat roughly *every* 284 days since it began testing in 1964, and has a nuclear stockpile of abut 450 weapons with a cumulative explosive power of 250megatons. China is weapon design. In these tests, plutontum or highly enriched uranium is largely or often completely replaced by natural or depleted uranium. But the other components of the device remain unaltered. Implosion and compression take place in the same way and are recorded with high speed X-ray cameras. A series of such tests can help designers perfect symmetrical, stable compression.

4. Experiments in nuclear fusion to develop understanding of the thermonuclear component of weapons as well of the deuterium—tritium boosters that make the fission components of warheads more efficient

5. Computer-simulation or information-site tests. Yield information relevant to weapons design.

6. Theoretical models (other than computer models)

7. There are tests on 'passive' or other components of weapons, which check their integrity and strength, or which examine weapon assemblies to ensure, for example, that they do not detonate when dropped accidentally or hit from one side (one-point safety test).

The last category of tests has nothing to do with the design of new weapons: such tests can at best help maintain existing arsenals. Logically, therefore, they should not be included in the scope of CTBT until dismantling of nuclear weapons arsenals begins. Similarly, there is adequate clarity that the first category, full-fledged nuclear weapon test explosions, must be totally prohibited. What of the rest?

What can be learnt about nuclear weapons design from which type of test?

- yield less than 50 grams of TNT equivalent: Information about one-point safely.
  2 Yield less than 200 grams Information about achievement of criticality.
- 3 Yield under 1.8 kgs: Criticality tests, measurements of temperature and pressure as criticality is achieved an other essential design informtion on the characteristics of the weapon at the very start of the nuclear explosion.
- *4* Yield up to several hundred Kgs Data enabling estimation of the yield of the weapon, and all the other data from the lower yield tests.
- 5 Yield of a few tens of tonnes:Development of advanced weapons consisting of fissile materials only (no thermonuclear component)
- *6* Yield of a few hundred tonnes: Most of the essential data about boosted fission as well as thermonuclear weapons

How Comprehensive!

The nuclear powers have been unwilling to forgo nuclear testing, even in the face of huge financial costs to themselves and opposition from their populations, unless they are able to continue weapons development by other means.

A lively debate has taken place in the weapons establishments of the US, France, and Russia over the extent to which computer simulation and programs of the same sort as the US Science-Based Stockpile Stewardship Program', and the French PALEN program need to be supplemented by 'hydronuclcar' tests of the power of a few Kg of TNT, and *very* small nuclear tests of up to 100 tons of TNT (04 kilotons).

The original position of the different nuclear weapons states: The United States wanted a "comprehensive" teat ban that would permit hydronuclear tests up to 4 pounds; Russia would like to do tests of a few tens of tonnes; France would like several hundred tonnes. China would like a limit of several hundred tonnes if any exceptions are allowed because it feels that lower limits would enable the superpowers to design new weapons more easily than states with less technologically sophisticated equipment.

Ban the Bangs: All the Bangs

The disarmament movement and non-nuclear nations have argued that a test is a test, and that the allowing of 'mini' nuclear tests would enable warhead development to continue, while making enforcement of a test ban more technically problematic. Some nations party to the CTBT negotiations have wanted to ban not only low-yield nuclear tests proper, but also 'hydronuclear' tests and computer simulations.

India has tried to insert a definition of nuclear testing into the CTBT text that includes any release of nuclear energy at any yield however small, produced by fission or fusion bought about by the explosive or other compression of fissile material. This definition covers hydronuclear testing.

Difficulties in Detection

A ban on all testa including low-yield tests and HNEs is not without difficulty! It is easy enough to pick up tests of the type being done at Mururos and Lop Nor of 20-150 kilo tons, and down to about 1 kilo-ton. Smaller tests than 0.1 kilo-ton and very small low-yield' tests would be difficult (though not impossible) to detect via existing seismic methods. Discussions on monitoring arrange-

currently developing two new missile systems, one for deployment in the late 1990s, and one for deployment round 2010, as well as a new sea-launched missile for *use* in a new submarine series. China has also been testing long-range missiles off the north coast of Taiwan.

Chinese weapons are designed at the Ninth academy of the Chinese Academy of Engineering Physics at Mianyang, and plutonium has been produced at two reactors in Gansu and Sichuan. Plutonium production has currently ceased, but a new plutonium production reactor is planned.

The Lop Nor Test Site is in a part of China which is not inhabited by ethnic Chinese, but by Moslem Uighhur people, who would prefer to be independent Much of the fallout from atmospheric testing has in the recent past fallen on the Tibetans, who are also subject to waste disposal and uranium mining. People close to the lop Nor test site have complained of increases in the incidence of cancers and leukemias, and there have been demonstrations against testing. Military authorities have admitted that 'a few deaths'have occurred

China shows no inclination to desist either from weapons testing, or from provocative missile tests, and insists that it has already shown 'utmost restraint' by testing 'only' 43 (now 44) times. One more test, doubtless to come soon, will give it the same testing experience as the UK has. China plans at least three more tests before the year is out

Nuclear Testing and Weapons Design

Over the decades the information provided by nuclear tests has enabled the development of an enormous battery of techniques for the design of nuclear weapons, including theoretical methods and calculation! computer codes, and diverse kinds and sizes of laboratory experiments. While full scale testing of nuclear weapons is the one way in which all the relevant characteristics of a new warhead design can be definitely determined, new weapons can be designed without full scale tests. The degree of confidence in the functioning of a new warhead that has been designed without full-scale tests depends on (i)the range and sophistication of the techniques that are used in the design process, (ii) the complexity of the design, and (iii) the relation of the new design to the designs of warheads that have already been tested.

Nuclear weapons have been suc cess fully designed without full scale tests.In fact, the design of the bomb dropped over Hiroshima was not tested prior to use. That is because the scientists and engineers of the Manhattan Project were *very* confident that the relative simplicity of the "gun-type" design corn-bined with the various theoretical, laboratory and non-nuclear field tests were sufficient to guarantee success. In contrast, they were far less sure of the implosion design that was needed for the plutonium weapon used later on Nagasaki, since the timing of the firing of the conventional explosives that triggered the weapon was so critical.

Types of Tests

There are seven broad categories of techniques that can assist in the design of new warheads without full-scale testing: (By full-scale weapons tests one means the detonation of a nuclear explosive device and the release of large quantities of nuclear energy running into thousands of tons of TNT equivalent.)

1. Nuclear explosions ranging from a few tens of pounds to a few hundred tons of TNT equivalent or less that are not quite full-scale explosions, but which yield most of the crucial information about the functioning of the weapon, other than its exact explosive yield.

2. Hydro Nuclear Explosions (HNEs): These are small scale nuclear explosions which are usually, but not always conducted at test sites, which have low yields, of a few kg of TNT equivalent Hydronuclear explosions are tests which use a limited quantity of plutonium or highly enriched uranium, but do involve a chain reaction. The chain reaction takes place upon detonation, but proceeds far more slowly than in a complete device. The explosion blows the HNE device apart before much energy is released. This stops the chain reaction. The prefix 'hydro' denotes that the core of the HNB device behave like a fluid under compression by a chemical high explosive. Sufficient energy may be released to melt the core, but not enough to heat it to plasma temperatures and make it explode "like a bomb'.

3. Hydrodynamic teats: These study the dynamics of materials (in particular, dummy explosion assemblies) in motion and under compression, but do not involve a release of fission energy. These experiments are typically conducted above ground, in laboratories. These tests by themselves cannot establish the yield of a particular

ments are being vigorously pursued, and it seems likely that an international monitoring system possibly in some association with the IAEA, will be created, incorporating seismic, radio nuclide, hydioaccoustic, and infrasound detection technologies.

The discussions cover rather, the number of monitoring stations, the exact 'mix' of monitoring methods, the point at which inspections might be required, and the relationship between the international monitoring system and national systems (mostly US and Russian spy satellites. They also cover funding and institutional arrangements.

The new positions

President Clinton has announced that he strongly backs a zero threshold CTBT. and has been followed in this by the French who have affirmed that they will not test any more and will rely on the PALEN simulation program to maintain stockpile confidence. In Frances case, the sudden conversion to a Zero threshold CTBT is a result of the intense global pressure they have been under.

The Letter but not the Spirit

In theory, programs such as Frances PALEN program and the US 'Science- Based Stockpile Maintenance' program in combination with sophisticated computer-simulation programs do no more than maintain existing nuclear capacities. Even to maintain existing nuclear capacities however, runs counter the original thinking of a test ban treaty, which was precisely that in the absence of tests, nuclear powers would over the years lose confidence' in their stockpiles. This wasn't a danger to be avoided: It was central to the whole idea!

The danger lies in the very sophisticated nature of the stockpile maintenance programme in especially the US, with a heavy reliance on facilities such as the DARHT facility (Dual-Axis Radiographic Hydrodynamic Test Facility), which performs ultra-high speed x-ray photographs of the high-explosive part of a nuclear explosion, in which the warhead material is compressed by high-explosives into a supercritical configuration, and the NIF facility. NIF is an ultra-power. ful (and ultra-costly) laser device designed to look at nuclear fusion by focusing vast amounts of laser light on tiny tritium/deuterium pellets, providing the necessary conditions for fusion reactions to occur. Concern has been raised that this facility will in fact also duplicate the conditions of a thermonuclear 'secondary', enabling research related to the design of thermonuclear weapons to take place.

While the design of NIF is quite different to that of an H-bomb secondary, the thermonuclear reaction being explored is of course the same. What is of more concern however, is that whatever difficulties there may be in transferring NIF data directly to weapons-related research and new weapons design, NIF will be built in. and its institutional affiliations will be with, the Los Alamos Weapons Research Lab, and it has been widely seen within the lab itself as well as the wider public as a vastly expensive toy to keep one-time weapons designers from boredom. Of the two fecilities NIF and DARHT however, DARHT has no mission apart from weapons design, and it would be possible to design a weapon without NIF, but not without DARHT (or DAHRT's predecessor). Yet concern has been expressed over NIF, while DARHT has attracted almost no attention. DARHT is to be built in two stages, with one X-ray machine being built by 1997 and a second to be added by the year 2000. The two independent axes of observation will enable three-dimensional observation of the compression of materials simulating the pit of a warhead.

Like the US, France also has an ultra-powerful laser facility on the drawing boards, (and in an advanced stage of construction) also nominally for fusion-related research, and like the US, the French facility is under the wing of the CEA's PALEN program. Coupled with a possibly substantial hydronuclear testing program, and ultrs-powerful computer simulation capabilities, it may be possible for at least some weapons development to continue even in the complete absence of actual nuclear tests though weapons designers will always say that nothing beau the thrill of a real nuclear test.

Sources: John Hallam
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Arjun Makhijani: Science for Democratic Actum
'Testing Times' by Praful Bidwai and Achin Vanaik

Six Steps to Nuclear Disarmament

There used to be a time when asking for nuclear disarmament was like asking for the moon. It was an idea confined to a tiny minority that refused to accept that the fears and human suffering of the last 50 years was the most that one could hope *for*. Times have changed. The tiny minority has grown in numbers and gained support from surprising quarters; former nuclear weapons designers, war planners and even generals have begun to speak out in favour of a nuclear weapons-free world. And for the first time they have a plan based on the experience with the abolition of chemical and biological weapons. In 1952, there was an agree* ment not to use "poisonous gases" and "bacteriological methods" in war. It was a deliberate act of restraint, many countries had these weapons but promised not to use them, and that promise has by and large been kept. From the promise not to use them to banning them altogether, has been a long but not very difficult road. It was long only because it was being travelled for the first time, and the way was uncertain.

Biological weapons were banned by the 1972 Biological Weapons Convention and about 130 countries have signed so far. The convention bans the development, production and stockpiling of dangerous biological materials for any thing other than "peaceful activities. The Chemical Weapons Convention was opened for signatures in 1993 and so far about 160 countries have signed. This is an even stricter convention: it bans the production, development, possession and use of chemical weapons and has created an Organisation for the Prohibition of Chemical Weapons to make sure that no country cheats on its commitments. The precedent is clear. Countries must first agree not to use a particular kind of weapon and then negotiate a convention to ban its development, production and use. This approach can be applied to nuclear weapons. The whole strategy on nuclear deterrence is premised on threat of use which has now been declared illegal by the World Court.

The demand for talks leading to a Nuclear Weapons Convention can be raised *in* the United Nations General Assembly. In its very first resolution in January 1946, the General Assembly unanimously adopted a resolution that nuclear weapons should be abolished. Fifty years is high time that UN begins implementing that first resolution. Only the nuclear weapons powers could possibly be opposed to such a demand, and it is by no means clear that all the nuclear powers would be opposed Those that are opposed would be exposed, isolated and deservedly condemned by the international community.

What is important, however, is for a deadline to be built into the talks on a convention. It should be ready for signature by the year 2000. A date is required and this choice is better than any other. Firstly, a clear deadline, set in advance, will make sure talks don't drag on for years. Secondly, the time is long enough to negotiate a treaty. Thirdly, and most importantly, as interest increasingly focuses on the coming of the 21st century, a Nuclear Weapons Convention could become the right of passage into a newer and better future. As such it could capture the world's attention, and with the whole world watching not even the US would wish to be seen as trying to hold the future hostage.

While these negotiations are going on, those countries that don't have nuclear weapons must create additional nuclear weapons free zones such as those established in South America by the Treaty of Tlatelolco, in the South Pacific by the Treaty of Raratonga and the recently announced African Nuclear Weapons Free Zone. The effect of these treaties is to constrain the movement of nuclear weapons. The aim must be to restrict nuclear weapons to the territory of the countries that actually made them.

The first step towards a world free of nuclear weapons is that the missiles, submarines and planes that carry them need to be withdrawn from active duty, Then nuclear weapons must taken out and decommissioned A disabled warhead is much less dangerous; it cannot go off accidentally, and it is useless to anybody who tries to use it. To make sure that no country tries to hide a few bombs away, everything must be kept under international safeguards. Teams of inspectors, and guards, from many countries will have to work together to keep an eye on each country that has stores of nuclear weapons.

The second step must be to destroy the nuclear capable delivery systems the aeroplanes and missiles that are used to carry the nuclear weapons. Without delivery systems even if a country managed to hide a nuclear weapon or two from the international inspectors, it would have no way of quickly taking them to a target and exploding them.

The third step is for all kinds of tests of nuclear weapons to be banned by a Comprehensive Test Ban Treaty. The first step in such a ban must be to close all the nuclear test sites, this is because testing nuclear weapons is more than just letting off of a nuclear explosion: it is actually a giant scientific experiment, costing millions of dollars, requiring many scientists and large amounts of sophisticated equipment. Closing the test sites will mean that a country wishing to explode a nuclear weapon as a test will have to first prepare a new test site. This can be seen from satellites; it cannot be kept a secret

The ban on tests must also include those conducted in laboratories. Nuclear powers have been testing nuclear weapons for decades. This has allowed them to create computer models they can use to design new kinds of bombs. To make sure that computer Simulations of nuclear weapons is not taking place, all nuclear weapons laboratories will have to be subjected to international monitoring.

Since the objective is a nuclear weapons free world, it only makes sense to get rid of existing nuclear weapons if no new ones are Being made to replace them. Otherwise, old bombs will be replaced with new bombs, and the process will continue. To ensure this requires a stock taking of alt weapons usable radioactive materials: how much material for making nuclear weapons is there already, and where is it. This means that the nuclear facilities in all countries will have to be visited by international teams of inspectors who will undertake this nuclear audit. The report on this audit must be a public international registry of all the radioactive material that can be used to make nuclear weapons. Any country trying to hide nuclear weapons material from the nuclear auditors will not be able to hide more than a small amount. There can be no secret stockpiles of this material that is of any military significance.

Once the amount and location of all the material is known, the factories for making nuclear weapons-and these are factories-can be closed down and all the specialised equipmem dismantled. This is the fifth step. It will make it enormously difficult for any country to ever produce more than a few nuclear weapons, unless it is prepared to get caught and face the international consequences.

To complete the process of abolishtrig nuclear weapons forever the sixth and final step is to ban the military and commercial production and processing of all radioactive materials needed to make nuclear weapons. The ban must include the commercial sector because some of the materials produced by commercial nuclear power stations can be used in the production of nuclear weapons. There is no way of avoiding if any ban is to be permanent. Ending the nuclear weapons age will mean an end to the nuclear age in all its different forms.

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Reviews

Radioactive Heaven and Earth

Plutonium: Deadly Gold of the Nuclear Age

Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and Its Health and Environmental Effects

Nuclear weapons production and testing comes at a considerable real cost in terms of human health and the health of the environment. However, these costs though indisputable are difficult to evaluate because of the following:

1. Governments (all governments of nuclear weapons states and India of the "Peaceful Nuclear Explosion fame) have deliberately withheld whatever information is available from public view. The attempt has always been, irrespective of the ideology of the state to allay public tears rather than to educate so that anyone and everyone can decide tor themselves.

2. The information that is available especially regarding the people at highest risk is seriously flawed. No attempts were made to study the effects of nuclear weapons testing on these people seriously. The people who conducted the tests in all countries were absolutely convinced in the first place that nuclear weapons were essential to security of the country and as a corollary felt justified in subjecting their own populations to risk. The studies that have been conducted on health effects of atmospheric nuclear tests and from venting of underground nuclear tests are grossly inadequate. The estimates of doses that high risk populations have received are serious underestimates made more with a view to decrease compensation claims than with any sciontitic objectivity.

3. No serious studies have at all been done on risks to future generations from underground testing. It is well recognised by everybody that storage of long-lived radioactive waste is a risky business. No country in the world has been able to construct a repository for long-lived radioactive nuclear waste despite strenuous effort. And vet unclear weapons powers have been without a care in the world conducting one underground explosion after the other which in effect means pumping long lived radioactive waste into the ground whose rocks have been fractured by repeated explosions.

These and many others detailing the harm done by different processes involved in the production of nuclear weapons are the conclusions of the remarkable series of books published by International Physicians for the Prevention of Nuclear War (IPPNW) in collaboration with Institute for Energy and Environmental Research (IEER). It ought to be noted that the harm done has been mainly to the populations of the nuclear weapons states themselves tor whose security presumably the bombs were being built in the first place, It is a different mutter that all the nuclear weapons powers have so chosen these populatious that they have been unable to protest effectively for long.

The books are very well produced and have extensive documentation. Whatever information is available from different countries has been meticulously collected and verified. However, a small error which my nit-picking self cannot pass over without comment: The map on page 558 in Nuclear Wastelands showing actual and potential nuclear weapons production and testing sites in India and Pakistan, has left out Kakrapar entirely. Similarly missing are a number of heavy water production facilities whereas some have **been in**cluded. Although the books are detailed scientifically exacting studies, at the same time they can be profitably read by any interested lay person. To use modern jargon for a book which eschews jargon, they have demystified the subject. Those interested in the subject should contact us or Dr Arjun Makhijani at the address given below. It might be possible to obtain these books free or may be for the cost of shipping.

Contact Address:
Dr Arjun Makbijani
IEER, *6935 Laurel Avenue Takoma Park MD 20912 U.S.A.*

Surendra Gadekar

Excuses, Excuses...and a cry for help

Anumukti is a bimonthly publication. A bland statement like this normally implies that an issue is produced every two months. Unfortunately, we have never ever in the last nine years been able to stick to this schedule but at least we were able to bring out six issues every year and you our readers were indulgent enough to allow us this laxity without too much protest.

This year has been a disgrace. From August '95 till now we have been able to produce counting this just three issues. An incensed reader has demanded his money back. Others too have justifiably complained.

What can I say? I have bitten off more than I can chew and this incompetence is the result. In a moment of weakness five years ago, I had agreed to become trustee of Suruchi Shikshan Vasahat Trust. This organisation was started by the pioneering efforts of Shri Mohan Parikh, who believed that an institute imparting training should first and foremost be able to run itself as a successful business and not depend on any donations from altruistic individuals. Suruchi started as a printing press and later as a place for research and extension into alternative energy and agricultural hand tools. In Mohan Parikh's time it did pioneering work which was awarded the Jamnalal Bajaj Award for application of technology to rural areas. Alas, as is true of many institutions, it could not sustain the thrust of its founder and many ills presently beset it. And being a trustee who happens to live not very far away (20 km) it has fallen on me to set things right. This is a herculean effort and I am not up to it. Certainly not up to doing that and managing to bring Anumukti out on time. There are distractions galore. Like an invitation to go to Vienna for the "Ten Years of Chernobyl" (a detailed report in the next issue) Conference, which we combined with a trip to Germany (See Germans say no to nuclear waste on page 5), the Netherlands and the US. Both a holiday as well as a chance to renew contacts and learn afresh about the nuclear issue.

What we now propose to do is to bring out a double issue on Chernobyl next. There is a great deal of accumulated material. Hopefully this would be done quickly enough so that we do catch up a little. However, the real problem is not the present crisis but an absence of helping hands in the long term. Hence, this appeal. We would welcome, nay greatly appreciate any constructive help from anybody who feels committed to either the antinuclear cause or the alternative energy cause.

Subscription

Rs. 30/- per year (6 issues) (within India)
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/- Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat Printry, Ahmedabad.

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ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 9 Number 4 February/March 1996

Attempting to Fool Some off the People All the Time

A recent news item in 'the Meghalaya Guardian (August 1, 1996) states that "The Uranium Corporation of India Ltd (UCIL) proposes to acquire ten square kilometres of land in the uranium deposit areas of Domiasiat in Hima Langrin of the West Khasi Hills at a compensation of Rs 8 crores." About 30,000 people are likely to be displaced and the UC1L is promising to provide 85 percent of the jobs to locals of the area.

As early as 1954, when Shri Vishnuram Medhi was the Chief Minister of Assam, the government had laid claim to all the minerals in the state including coal and limestone. This proposal had been strongly opposed by the local leadership and in 1958 at the time when Shri B. P. Chaliha was Chief Minister, the government had abandoned its claim. The leader of the opposition Mr. B. B. Lyngdoh feels that the government cannot now displace the tribal population of the area to mine uranium.

The first news regarding the uranium deposit found in the area was in a news item in the Indian Express on the 13th of August 1991. In that it said that the "deposit is the largest, richest, near surface and low cost sandstone type uranium deposit discovered in India so far. The ores are spread over a ten square kilometre area at deposits varying from eight to 47 metres from the surface. Six layers of varying dimensions with grades up to 0.41 per cent of uranium oxide have been delineated by drilling.

The Atomic Mineral Division of the Department of Atomic Energy had discovered uranium in the West Khasi Hills some time before 1991. In the name of prospecting and taking samples they have already taken out vast quantities running into hundreds of tonnes of ore. This was strongly opposed by the local population. Mr. P. P. Lyngdoh, President of the youth wing of the Hill State People's Democratic Party has been active in opposing this 'illegal mining'. Now, the Uranium Corporation of India has decided to 'properly' acquire the land and do legalised destruction.

As part of their efforts to stop this assault on their territory, people had also sent a letter to the Prime Minister. The Department of Atomic Energy had been asked to explain and in its letter of reply had the cheek to say the following:

"The natural radiation level is relatively high around Domiasiat because of the relatively higher concentration of uranium in the area. The higher concentration in the Killing Nale section is related to the fact that the uranium ore-body is exposed along the banks of the nale, whereas, elsewhere the sediments over the ore-body have helped in reducing the radiation level at the surface. Therefore, the present level of radiation in the area is a natural phenomenon, not induced by the exploration activities of the Atomic Minerals Division and will remain there for thousands of years if the uranium ore-body is not mined. Mining will only help in removing the uranium, which is the source of the radiation."

The letter dated 12/4/95 is signed by Shri B. K. Satra, Joint Secretary (R&D) and has been sent from the Department of Atomic Energy's office in Bombay.

This is a just an example of how the government through its paid scientists tries to fool the people all the time. Doesn't this worthy know that although uranium is the source of radiation, in any ore-body there are many other radionuclides, the so called uranium daughters and although most of the uranium is removed from the site after mining more than 85 petcent of the radioactivity remains at the site. And mining of the ore are just means the sediments over the ore body are removed so that il gels exposed. Milling of the ore makes the ore into a powdery form so that radon 222 which is a decay product of uranium in the ore and is itself a radioactive gas gels released to the atmosphere. Free of the confinement placed by nature, these radionuclides some of them with half-lives as long as 80,000 years, cause havoc in the surroundings. The effect of uranium mining all over the world has been to increase the radioactive burden on the people and the environment. To give an impression that mining shall reduce radioactivity in the region is not only fraudulent but stinks of contempt for human rights

Surendra Gadekar.

From *The Editor's Desk*

In our last issue, I had promised that we would be bringing out a special double issue on Chernobyl. However, I find that the amount of new material on Cher yl is so enormous that to read il and edit it to make an interes Issue is a task that takes time. So this issue is what is called in the jargon as a quicky. It is something like what the nuclear authorities in India did right at the beginning of the nuclear power generation programme. They had decided to go in for CANDU type reactors since they used natural uranium which was available in India and had on-line refuelling capability which left the much cherished nuclear option in the stale of delightful ambiguity and other reasons as well. However, after finalising the decision to go in for CANDUs, they were offered a deal they could not refuse. General Electric Co. was willing to give a set of its Boiling Water Reactors so cheap that despite the disadvantages of becoming dependent on a foreign source of fuel (since India did not and still does not have enrichment facilities for making the kind of fuel required in these reactors and also the disadvantage of having two different types of reactor systems operating in the country, nucleocrats decided to do a quicky and the Tarapur reactors were built. The fact that dependence on fuel for Tarapur was exploited by the US to bring pressure on India to toe the line is another story.

This quicky issue of Anumukti would not have been possible without the ubiquitous foreign hand behind it. Unlike the help for Tarapur reactors, or other nuclear or even non-nuclear mega projects, which have a client server relationship, this help is mutual cooperation between friends. The *World Information Service for Energy* is a small group of young activists based in Amsterdam who bring out a fortnightly news communique. They act as a worldwide clearing house for information regarding nuclear issues. During a recent visit abroad, we visited them and renewed the bonds of friendship. Most of the stories in this issue have been taken from various WISE news communiques of course with some editiorial comments added.

Energy & Security

Another group with whom we had a very fruitful interchange was lnsitute for Energy and Environmental Research (JEER) in Washington. They bring out a newsletter, *Science for Democratic Action* which demystifies the jargon associated with nuclear enterprise in America and helps grassroots activist groups with technically sound but accessible information. They wish to bring out a global quarterly journal, "*Energy and Security" on* similar lines. This would deal with issues of disarmament, non-proliferation, and sustainable energy lifestyles. The first issue ought to be out within a few days and we. would arrange to send a sample copy to subscribers of Anumukti. If you want to continue receiving the journal (free) please do drop in a line to us in reply.

The Skeletons in the Cupboard Keep Appearing

1958 ACCIDENT AT GREENHAM COMMON

One of the persistent comments often heard about the Chernobyl disaster in Western media has been that the communist government of the Soviet Union tried to hide the truth from its own citizens. This is said with so much contempt that one takes it for granted that the 'freedom loving', democratic governments of the West could never even have contemplated keeping its citizens in the dark. What one finds rather is that these governments because of their veneer of openness managed to hide inconvenient facts not for a mere two days as the Soviet Union managed to do but for well close to thirty years. Truly il has been said that Western democracies manage things better.

The Campaign for. Nuclear Disarmament (CND) has uncovered documents which show that for over 30 years the British and American governments deliberately covered up a serious nuclear accident at the US Air Force base in Greenham Common (UK). The accident, put at risk the lives of hundreds of thousands of US and British service personnel, civilians working on the base, local residents, peace campaigners, police officers and journalists. Local land and animals were contaminated. The radioactive dust from the accident continues to pose a serious threat to the local environment and to the health of local residents in an area renowned for an unexplained cancer cluster.

The accident occurred at 4.25 p.m. on February 28, 1958, when an American B-47 nuclear bomber - loaded with its nuclear weapon caught fire. The aircraft awaiting take-off on the runway was engulfed in a fireball when a wing-tip tank carrying 1,700 gallons of fuel from another B-47 flying overhead was accidentally dropped. The fuel tank landed just 65 feet behind the parked B-47 and directly in line with it, igniting on impact and engulfing the plane. The bomb burned, releasing deadly uranium and plutonium oxide powder over an area of several miles around the base. The conventional explosive in the warhead exploded, helping to scatter very fine uranium and plutonium particles. Because of their high magnesium content both the aircraft and its payload burned extremely vigorously. In fact the aircraft was simply allowed to burn out because it was impossible 10 extinguish the magnesium. The fire was still smouldering five days later, the heat reaching temperalures as high as 1,000 degrees Celsius, explosions could be heard for miles around, and local firemen at first believed that there had been an atomic explosion at the base. A man underneath the aircraft at the time - who may have been involved in the bomb's loading procedure - was burned to death. A number of other service personnel were killed and injured in the accident. A board of officers was appointed to investigate the accident. Its findings are still secret. It is not known what happened to the wreckage of the plane or the bomb.

In May 1960, a group of scientists working at the atomic weapons research establishment (AWRE) at Aldermaston delected, almost by chance, highly radioactive readings near the establishment which could not possibly be explained by its emissions. They used readings taken from laurel leaves, which are highly accurate indicators of uranium contamination, and discovered that the amount of uranium-235 to the west of Aldermaston was one hundred times greater than could be accounted for by AWRE's discharges. When plotted, their readings showed hourglass-shaped contours of radioactive contamination centring around the runway at Greenham Common, which at the time was the base for US Air Force B-47 bombers on constant "Reflex Alert", loaded with nuclear bombs and ready to fly to the Soviet Union at a few minutes' notice. The findings were written up in a secret report called "The distribution of uranium-235 and plutonium-239 around the USAF Greenham Common, Berkshire and submitted in August 1961 to Sir William Penney, the head of the UK Atomic Energy Authority (UKAEA) and one of the architects of the British nuclear lx>mb program. The research team was led by R. Morgan, a radiochemist from Aldermaston. The report carries no AWRE or UKAEA report reference number and is not in any of the standard classified reports series produced by Harwell and Aldermaston. However, the government has recently confirmed the existence of this report and told Parliament that its contents would remain secret. The report states clearly that the quantities involved and the wide dispersal are such that "the release must have been accidental. Further, in order to release 10-20 grams of finely dispersed uranium, much larger amounts must **have been involved** in the accident and it **seems the** only possible **way such a large** quantity could **become powdered** is through **the agency** of fire.".

Parts of this report have now been obtained by CND, including a map of the spread of contamination from the accident around West Berks hire and North Hampshire. CND has also obtained secret letters written during the investigation, and has learned about other official government investigations which have confirmed that a nuclear accident did indeed occur at Greenham Common.

As recently as 1994, a fallow-up survey by Aldermaston scantists of the area detected contaminated fall-out from the 1958 accident. A total of between 10-20 grams of uranium was released and dispersed outside the base, yet no clean-up operation has ever been mounted. A much greater amount of plutonium and uranium was certainly deposited inside the base itself on and around the runway - the warhead involved contained about 20 kg of plutonium and 30-*40* kg of enriched uranium - yet the contaminated runway has been crushed and now stands in piles blowing dust over the surrounding area. There is a well-known cancer cluster in the area, and official government studies have confirmed an unusually high incidence of radiation-linked cancer among children living in the area.

The accusing finger has been pointed at the AWRE at Aldermaston and Burghfield, but detailed studies have been unable to find a link between these establishments and cancer among local children. Persistent reports of unusually high and radiation-linked cancers in the area were first revealed in letters to The Lancet, a medical journal, in November 1985 and February 1986, The first letter stated that "since the establishment of a paediatric oncology/haematology clinic at the Royal Berkshire Hospital, Reading, in 1971 we have been concerned that we were seeing more children with acute leukaemia than might be expected in a population the size of our health district's". In 1989, the government appointed its Committee on Medical Aspects of Radiation in the Environment (COMARE) to investigate the claims, and specifically to establish whether there was any link between the cancer clusters and Aldermaston and Burghfield COMARE concluded that there was a "small but statistically significant" increase in the number of cancers that would be expected among young children in the area. However, it was unable to find any link between its findings and emissions from either Aldermaston or Burghfield. Greenham Common was not included in the COMARE study, even though the government knew that the spread of radiation recorded in a 1961 study covered much of the area looked into by COMARE. Other areas covered with contaminated dust by the Greenham Common accident were excluded from the COMARE survey. The Ministry of Defence did not tell COMARE's research team about the accident at Greenham Common, and did not pass to them either the original 1961 report or the 1987 Saxby report. (A study has been written up by W. N. Saxby, a Technical Staff Officer from Aldermaston's Safety Division, and an experienced scientist who had been involved in monitoring fall-out from Britain's atmospheric atomic tests in the South Pacific. Saxby's report confirmed that a nuclear accident had taken place at Greenham Common and found the same hour-glass shaped deposits of contamination around the runway that were found in the first report *of* 1961, The Saxby report is

The 1961 report by Aldermaston's scientists directly disputes the American base commander's statement who denied that the accident involved nuclear weapons. The setentists claims "We suggest that, in fact, a nuclear weapon may have been carried in the aircraft and burned with it," Radioactive debris from the bomb was stuck to Greenham Common's runway by the firefighters' foam. However, the scientists found that the contaminated debris has been repeatedly disturbed by vehicle and aircraft movements and Jet blasts wearing away the runway surface and causing radioactive dust to be blown out of the base into the surrounding countryside. In particular the report warns about the danger of continuing to use the runway because "the high temperature of the air from the jets would cause it to rise, carrying dust and sand particles up with it". The hourglass)shaped concentrations of radiation materialised because Greenham Common has just one runway with two take-off directions.

It emerged in 1979 that the British and American governments had agreed in 1956 to deny that nuclear weapons were present in any accident involving American nuclear bombers stationed in the UK. The agreement surfaced after details of another crash involving a USAF B-47 - which crashed into a nuclear bomb storage bunker at RAF Lakenheath in 1956 - were revealed by an American newspaper with close links to the US Air Force.

According to a former US Strategic Air Command officer, orders came down to keep "nukes" out of the records. Officially they did not exist.

SOURCE: CND, 162 Holloway Road, London N78dq,Uk

Do *People Want Nuclear* Power? Mo *Way! Saw the Residents* of *Maki in Japan*

A referendum was held on August 4 in Maki town, 25 km Southwest of Nigata City (Nigata Prefecture, mid-north Japan), in which over 60% of the voters said "No!" to the proposed construction of a four-unit nuclear power station in the town. A shocking blow not only to the Tohoku Electric Power Co., but to the central government as well.

Although this referendum does not legally bind the local and national administrations, the mayor of Maki town, Mr. Sasaguchi, had stated before the referendum that the municipal government would respect the result of the poll. In a press conference after the tally of the votes, Mayor Sasaguchi said the town would not sell the disputed piece of land to the electric company. This definitely means that there would be no Maki nuclear power station. Although Tohoku Electric has already 97% of the land it needs to start constructing on public land in question which is centrally located in the intended site.

The plan to build an 825-MW boiling water reactor (BWR) in Maki, which was first proposed in 1969, has been on hold since 1983 precisely because of the great difficulty Tohoku Electric has encountered in buying the necessary land for the site. There were 12,478 votes against the NPS proposal, with only 7,904 in favour. (118 votes were invalid.) Despite the rainy weather, as much as 88.29% of the electorate voted in the poll, showing the strong interest amongst residents on the issue.

This is the very first time in Japan that local residents were directly consulted if they want a nuclear plant in their backyard. The result inevitably affected the national nuclear energy policy.

"I doubt if the voters really understood the necessity and safety of the atomic energy, was the insulting remark of a pro-nuke town councillor, upset by the referendum result. Given the politically conservative background of Maki town, and despite the corrupt practices on the part of the utility (backed up by the Agency of National Resources and Energy), the people clearly expressed their opinion, fulfilling their responsibility to future generations.

Three other towns/cities in Japan enacted N-plant Referendum Act in order to settle siting disputes. But actual polls have been postponed. The Maki result may have significant influence on the political climate in these localities.

The Ministry of International Trade and Industry (MITI) and the subordinate Natural Resources and Energy Agency say the nuclear energy police must continue as it is a national policy in the national interest and must take precedence over local interest. In a bid to promote construction of more nuclear reactors, MITI said on August 23 it would increase subsidies to local governments which host nuclear power plants. "In recent years it has become increasingly difficult to obtain land to build nuclear power plants," a MITI official said. "It is vital to gain local understanding." Annual subsidies to local governments with nuclear power plants are to raised to 80 million yen (US $ 740,000) per one million kilowatts. Under the current system, only economically poor areas receive subsidies of 40 million yen (US $ 370,000) per nuclear reactor, on condition that the reactors have been operating for more than 15 years.

Source: Wise News Comm. 457

The "We Bring Good Things to Life" People Try to Kill Unfavourable News

Not only Indian politicians like to muzzle the press; large multinational corporations so concious of their image are equally inclined. The US power giant General Electric (GE) whose motto is: "We bring good things to life" announced on 28 February 1996 its plan to kill its Advanced Light Water Reactor (ALWR) programme, saying that "extensive evaluations of the market competitiveness of a 600 MWe size ALWR have not established the commercial viability of these designs." GE quickly realised what it had done and tried to limit the damage by saying that the company had **not** intended to suggest that there was no commercial niche for other 600 MW ALWR's and acknowledged that the announcement made it look like GE was "taking a poke at Westinghouse". GE was so concerned about the implications that it offered on 28 February to pay for the cost of Nucleonics Week's pulling back and reprinting of all copies of the February 29 issue of the newsletter, with the phrase reworded so that only 600 MW Boiling Water Reactors of GE design would be implicated by the GE market analyses. *Nucleonics Week* declined the offer.

(Nucleonics Week, March 7,1996)

FRENCH ELECTRICITY EXPORTS

Despite claims of Elcctricite de France (EdF) of making, profits on the export of electricity, the opposite is true. A critical report by the French energy consultancy INESTENE states that EdF should freeze exports of electricity and abandon construction of new nuclear plants. That would be less costly to the country than continuing electricity exports. INESTENE estimates that EdE's export business is losing the company at least Ffr5 billion ($958 million) per year.

Export tariffs are lower than prices for the French industry. Over the past five years, the average export price varied from Ffr0.19 to Ffr0. 227 per kilowatt-hour (KWh) and thus was less than half the average EdF tariff (Ffr0.44). The average electricity export price is also less than the full cost of a French nuclear KWh, which is Ffr0.2275 in 1995 currency. This is a conservative estimate of the nuclear KWh price, because it is lower than a reference price calculated by International Energy Agency (IEA) methods. The cost of exporting electricity also exceeds the revenues received for the exported KWh's. According to the most conservative models of INESTENE, the annual balance of costs for exports show an economic loss of Ffr5 billion. Other less optimistic estimates show a total loss for the country of Ffrl0-35 billion. The emerging conclusion is that exporting electricity can never be profitable in the long term. The report contradicts the belief that given France's overcapacity of 11,000 MW, it is less costly to keep existing power plants working than mothballing them. Freezing the construction of the four nuclear plants (two at Chooz and two at Civaux), which cost more than Ffr40 billion, saves EdF an expenditure of Ffr3.4 billion.

Furthermore, INESTENE concludes that a "significant part of the exported KWh's must be attributed to fossil fuel sources". In **1994, 40%** of **the** exports to the UK came from fossil fuel plants. The final analysts of the report: "EdF's electricity exports are not profitable either for the economy in general or for the French consumer. The export increases physical and financial risks as well as environmental damage. For the importing countries it is a costly solution for the consumer, a disregard for opinions *of* citizens and trade sector that is secretive and non-responding to market rules." By the way, the French government delayed the publication of another critical report, an IEA study on the French energy sector. The SEA concludes in this report that France is too dependant on nuclear energy.

Source: Power in Europe, 31 May 1996, issue 225, p. 1,2,13

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THE RED BOOK IS OUT AND THE BLACKEST ENTREE REFERS TO INDIA

URANIUM 1995: Resources, Production and Demand, Paris 1996, 362 pp. ISBN 92-64-14875-2; Price about US$ 80.

The book is published every other year and contains statistical data on uranium ore deposits and their exploration, uranium production, and reactor-related uranium requirements from 23 of the 25 uranium-producing countries of the world. The most remarkable change, compared to earlier editions of the book, is the inclusion of a paragraph on the environmental aspects of uranium production, in the general introduction, as well as in each national report.

But, the result of this new effort is rather disappointing: Only a few countries give an overview of the environmental impacts of the existing and former uranium mining operations, and how they are going to deal with them. Most countries present only a few rather general considerations, or simply describe, how environmental aspects are considered during the licensing process for new projects. One national report even states "There are no environmental issues related to existing uranium mines" (India), while many others simply omit the topic.

from the Guys Who Gave Us Chernobyl: A Now Offering
Coming Soon to a Coast Near You

WORLD'S FIRST FLOATING NUCLEAR PLANT

After years of financial delay, construction of the world's first floating nuclear power plant is underway in Russia. Engineers hope to have it ready to operate by 2001, a prospect that fills environmentalists with horror but has Russia looking south for potential buyers. Russia has long had plans to build a series of small floating nuclear power plants for use in remote regions which are not connected to the national grid, or to replace thermal nuclear power plants that have grown too expensive because of high fuel transportation costs. Andrei Gagarinsky, vice president of the Russian Nuclear Society and head of international relations at the Kurchatov Institute in Moscow, claims: "Russia will need at least 15 small, low-power floating nuclear power plants. They will be used in inaccessible regions of the Far East, extreme North, Altay Territory and the Kola Peninsula." He noted that Russia is the world leader in smalt nuclear power plant production and sees these plants as potential export products, especially to developing countries. He added that Indonesia, South Korea, China, and Vietnam have all expressed interest-

But environmentalists are not convinced. "We know about the quality of the Russian fleet's nuclear reactors. A Komsomolet nuclear submarine is still located at the bottom of the North Sea," says Vladimir Sliviak of the Socio-Ecological Union/Antinuclear Campaign in Moscow. "The Chernobyl explosion blew the reactor lid, a 2,000-ton block of concrete, into the air. These vessels will not even have that sort of protection. This must pose a clear risk to both the marine and land environment."

The floating plant is essentially a ship with two small pressurized water reactors (PWRs) known as KLT-40s, adapted from those used to power Russia's nuclear icebreakers. The KLT-40 enhanced safety PWR, designed by OKBM Experimental Design Bureau of Mechanical Engineering in Nizhny Novgorod, has been used for over 20 years to power the USSR's seven nuclear icebreakers as well as nuclear-powered cargo ships. The reactors each have a power output of 35-50 megawatts, giving the plant an overall capacity of up to 100 MW of power or 50 MW plus power-generating heal. Besides the OKBM, the Kurchatov Institute in Moscow and the Aisberg Design Bureau in St. Petersburg were involved in the design of the plant which is now being built at the Baltisky Shipyard in St. Petersburg.

If everything is going according to plan, the first plant will be sited at the Arctic seaport of Pivek in the Chukotka Peninsula in the far northeast. It will be operated by 40-50 people working in shifts and has a design life of around 40 years. Spent fuel and wastes will be stored on board and every 13 years it will be towed 4,000 kilometers through Arctic seas to Murmansk in the Kola peninsula in Russia's northwest for maintenance and reloading with fresh fuel. During this procedure, which will take around a year, a substitute floating plant will be put in place. The floating reactor is expected to cost $254 million and will take six years to build.

According to Alexander Poloushkin, director general of the Malaya Energetika Research and Production Association: "The plant has reliable protection systems to safeguard against all possible risks, including sinking, capsizing and even an aircraft crashing on top of it," he says. "It won't pollute the area with any nuclear waste because it will be stored on board." (nice try!)

Source and Contact: Vladimir Sliviak,
International Nuclear Campaigner,
Socio-Ecological Union Campaign,
PO Box 211, 121019 Moscow, Russia.

Letter Box

1 visit Mysore city quite often and recently while miking with environmental groups there , I was surprised to know that Government of India has established an industrial unit under the name of Rare Materials Plant which covertly processes nuclear material for both "peaceful" and "defence" needs. I have also been informed that citizens contacting the management regarding the true nature of the plant are given the silent treatment, this makes the existance of the unit all the more suspicious and extremely dangerous to human habitats in the vicinity from a health point of view.

Any information from individuals and groups will be most useful and can be sent directly to me.

C. *Krishnamurthi*
C/o Ayeshvarya Rural Womens Welfare
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Armenia in a Bind

No Alternative But Nuclear

Nucleocrats in India have changed their tune. In a spirit of sweet reasonableness they are even willing to admit that nuclear power has not delivered on its past rosy promises. But, they add, despite this miserable past, we have no alternative but to develop it so that its contribution to the nation's electricity supply becomes 15 to 20 percent during the next 20 to 25 years, since the demand for power is skyrocketing and the coal quality is so bad. The following article, describes the devil and the deep blue sea choice facing the people of Armenia, because of an unhesitating acceptance of no alternative but nuclear power hind of thinking.

For six years Armenians lived in the semi-darkness of the Middle Ages. Beginning in 1989, these 3.7 million people in the southern Caucasus survived without adequate heat, transportation, or medical care. There were only endless candlelit evenings with no television or music. "You lived in the Sabbath all year long." a Jewish friend commented.

The crisis was precipitated by a devastating earthquake and the closure of Armenia's only nuclear power plant. It was compounded by the break-up of the Soviet Union and an economic blockade that cut the country off from other energy sources. The power shortage left the post-Soviet government with a stark choice: nuclear power or continued crisis.

For those living through the dark years, the risks associated with nuclear power were overshadowed by the hardship of this period. The reopening of the power plant, which occurred last fall, could never be merely a technical question.

The earthquake of December 7, 1988, measured 6.7 on the Richter scale. It took the lives of 30,000 people, levelled two cities and 55 villages, and destroyed one-tenth of the country's industry. It also shook faith in the safety of Armenia's only nuclear power plant. Medzamor, which sits in an unsafe seismic zone 30 miles south of the capital of Yerevan and 60 miles from where the quack hit.

The plant, which consists of two VVER 440/270 reactors (modified from VVER 440/230s), had one of the best safety records of Soviet-style reactors. Unit 1 came on line in 1976, and Unit 2 in 1980. They provided Armenia with a surplus of energy, which was exported to other parts of the Soviet Union and Turkey.

Even though the plant experienced no damage and was designed to withstand earthquake of up to 8.0, a large movement led by the country's Green Union called for its closure amid safety concerns and anti-Soviet sentiment. Armenia's growing self-determination movement focused on the potentially risky power plant as a symbol of Soviet domination and exploitation.

Alter heated disputes among politicians, scientists, and the Greens, the Supreme Soviet, the highest government body in the then Soviet republic of Armenia, agreed to shut it down. Between January and March 1989, the two reactors went off line. Nearly 40 percent of the country's total energy supply was no longer available.

The break-up of the Soviet Union, following closely on the heels of the plant closure, further destabilised the country. While many problems were common to all former Soviet republics, the era of independence began particularly unfavourably for Armenia, the smallest among the newly independent nations. Since 1989 Armenia has been locked in a bloody dispute with neighbouring Azerbaijan over the territory of the Nagorno-Karabakh, an enclave of Armenia deemed part of Azerbaijan by Josef Stalin in 1922. The ongoing war monopolised the human and financial resources necessary to build an independent post-Soviet infrastructure.

This once scientifically and culturally advanced country also was subjected to a total blockade related to the war by Azerbaijan and Turkey. Armenia's only remaining connection to the outside world was through its northern neighbour, Georgia. But during the fighting, the railway lines and gas pipelines that pass through Georgia were permanently destroyed by Azeris living in that country. Georgia, which did not investigate this terrorism, was believed to be pilfering the Armenian share of gas sent from Turkmenistan. With barricades on all sides, even the delivery of humanitarian aid, now completely dependent on air shipment, was slowed.

Six years

And so the crisis began. Industry slowed, factories shut down, and office workers were laid off. Even ambulance service was halted because of a lack of gasoline. People passed the winters in their apartments, where room temperatures hovered close to freezing. Deprived of their jobs, they had only two reasons to go out-to get fuel and food.

Under the blockade. Armenia could provide for only one-fourth of its daily bread. This brought long and excruciating bread lines, and often the military was required to keep order. Eventually a voucher rationing system was enforced, providing a daily ration of 8.8 ounces per person. " Every day pupils in the school arc fainting," said Hasmik Sargisyan, the director of studies at a secondary school in Yerevan. "The teachers used to keep sandwiches in their bags for emergency cases."

During this period people received only one to two hours of electricity a day, and their lives were defined by it. "We had to manage to do everything in two hours--to cook, to bathe, to wash, to watch TV," said Theresa Arazinan, a professor of musicology at the time was spent planning how to get candles and the fuel to fire wood stoves and kerosene lamps.

Alter the first two years, the government became more efficient in its use of energy and more became available for necessities including hospitals and factories. But people rigged up cable known as "left lines" to siphon off electricity from these high-priority users to augment their two-hours-a-day allowance. Some even attached the left lines to unused metal bed frames, heating them like giant radiators. According to Armenerg, the government's electricity agency, 40 percent of the electricity generated was used illegally. People joked that Armenia's President Levon Ter-Petrosian promised to provide the whole nation with "left lines."

The only outside help with heat came from a U.S. humanitarian program called "Winter Warmth," which provided kerosene to Armenia from 1992. Some people, however, were reluctant to use this fuel, as Armenian doctors warned that the fumes could be harmful to children.

Many people left the country. "I couldn't survive another winter in Armenia. This was sheer hell," said David Babayan, a writer and actor who immigrated to Moscow. According to the U.N. Development Program, 676,000 people-or about one fifth of the population-left during this period, many setting in Russia, the United States, or Israel. Much of the country's professional and artistic elite were part of this exodus. But millions of others remained.

The ***woodcutters***

At first chopping down city trees for fuel was considered shameful, and the main concern of woodcutters was to go unnoticed. At night, armed with axes and saws, they chopped the trees they had targeted during the day.

Very soon it was commonplace and no longer considered a dishonourable deed. The soot billowing from round holes in apartment windows was a sign of success. "I can plant tree in the spring, but I can't bring back my kids," said my neighbour, the father of five children.

People started with the tree in their gardens and ended up with those decorating the House of Parliament. The Ministry of Ecology estimates that 800,000 trees were chopped down throughout the country in the first two winters. After intensive wood cutting the cities seemed bald. "Good bye, and good luck in wood cutting," a television showman would say at the end of the programme. Trees became harder and harder to find. Today there is a memorial in Yerevan, a sculpture of a tree, erected sad a reminder of the "Genocide of Nature."

Getting ***around***

The streets of Yerevan were filled with pedestrians. People walked and drove by instinct, without the aid of street or traffic lights, which were turned on for only two days a year at Christmas time.

> *Why get into a situation where you are faced with two stark choices:either have the sword of nuclear disaster hanging over you or else freeze in the dark. A non-nuclear sustainable energy future if planned carefully in advance would avoid both pitfalls*

The energy shortage also paralysed public transportation. Often trolleys would be stalled on hills when the electricity was cut off. At these times male passengers would get out and push the trolley to the top, and then, like kids on a roller coaster, jump back in to enjoy the ride. When the rare trolley did get electricity, it carried many times more people than it could comfortably hold. And trolley doors never closed as dozens of people hung out of them in acrobatic positions.

Other chose to walk rather than stand in claustrophobic trolleys. With many extra pedestrians came extra falls on icy sidewalks. A common joke in Yerevan was that Armenians had become better at falling than Charlie Chaplin or Buster • Kcaton.

At the zoo

It was a sad day at the Yerevan Zoo when its only elephant, Vova, died in 1993. "The specialists failed to give a precise cause-cold, malnutrition, bad living conditions," said Hripsime Brutian of the zoo's publicity department.

The inhabitants of the zoo were kept in their winter houses, without electricity. "The animals have been in complete darkness for five months and will live [this way] another month until the winter is over," Karo Mandalyan, the zoo's manager, explained. Members of the zoo's staff did what they could. Many brought food from their homes. The snake keeper even took the snakes in their glass containers to his apartment where he could keep them warm with a wood heater. When the elephant died, it was used to feed the other animals.

"Only this winter, we lost *64* big and small animals: zebras, tigers, birds, wolves, and sheep-all from cold and hunger," said the manager. "Every morning I come to the zoo with the fear in my heart to see another dead animal." A visiting journalist filming the zoo for Germany's Stern Television said, "Damm, it was a concentration camp for animals."

A decision

As the energy crisis lingered with no end in sight, the Armenian government announced in April 1993 that it would restart one of the two units at Medzamor as the only viable short-term solution.

Armenian citizens were fully behind the decision, but they were alone in the view. All of the country's neighbours held protests, questioning the safety of the reactor. Turkey, which supported Azerbaijan in its war with Armenia, even offered at one point to lift its blockade if Armenia would keep the reactor off line.

The West also opposed Armenia's decision, and from the start refused to provide technical assistance or guidance for the plant's reactivation, arguing that because the plant was in a zone of high seismic activity, it could never meet safety standards. "We wanted to do all we could to prevent its restart," said a representative of the European Bank for Reconstruction and Development's Nuclear Safety Account (International Herald Tribune, October 25, 1995).

Armenian officials attributed Western objections to their interest in securing contracts for new power plants for Western businesses. "This is a struggle for the market," Vanik Nersisyan, deputy head of Armenia's Department of Atomic Energy, told the International Herald Tribune. "This is an issue of the employment of the Western population." Compared to building new plants, little money could be made in assisting in the upgrade of Medzamor. Armenian plants were not amongst those designated for Western 'help' for 11 other WERs currently operating in Bulgaria and Russia.

Spurned by Western authorities, the Armenian government turned to Russia for help. Russia provided Armenia with loans to upgrade the plant, including the addition of reinforcements against seismic activity and the construction of a new cooling-water lake.

When it became clear that Armenia would go ahead with or without Western assistance, equipment also was provided by France, Germany, Bulgaria, and other European countries. According to the April 6, 1996, New Scientist, some countries were changing their stand on even on the more dangerous RBMK reactors like those at Chernobyl. Again, some interpreted the change as a means of helping Western businesses benefit in the post-Soviet marketplace. "The closure of the reactors would mean that Western nuclear corporations would lose potentially valuable contracts for fitting safety equipment," said German Environment Minister Angela Merkel.

Between 1994 and 1995, more than 500 tons of equipment was airlifted to Medzamor, and 800 upgrades were performed to improve the reactor's safety. After frequently sending World Association of Nuclear Operators and International Atomic Energy Agency (IAEA) inspectors to Medzamor, the IAEA concluded in 1994 that "the plant is safe and there are no principal obstacles for the restart."

Ironically, when Medzamor's Unit 2 was turned on in November 5, 1995, it was greeted with the same euphoria that attended the decision to turn il off in 1989. The plant run at 92 percent capacity during the winter, according to the government's nuclear regulatory agency. It produce enough electricity to satisfy 25 percent of the needs of the country's population and industry.

Armenians are gradually recovering from the dark experience of the past years. They are coming round from the absurdity under which they lived, and getting back to a normal life-or as normal as life can be in the midst of war and a blockade. Today in Armenia we no longer hear children's hoorays when electricity is turned on. It is an accepted part of life, and these cheers are once again reserved for fireworks and Christmas trees

But recovery was built on nuclear energy—a necessary short-term compromise for a country that has no other reliable source of power available.

Source: Bulletin of Atomic Scientists
July/August 1996

Bangladesh Hunts for *Investors for Nuc*lear Power *Plant*

The Bangladeshi government is shortlisting investors willing to fund the Rooppur Nuclear Power Plant. The Bangladesh Atomic 'Energy Commission (BAEC) is considering private firms along with government agencies for the Rooppur plant as the government is now encouraging the private sector to fund such projects. The IAEA is willing to provide consultancy in the installation and operation of the plant. Since years, Bangladesh officials are advocates of nuclear technology and nuclear energy. In 1987, the head of the Bangladesh delegation to the United Nations conference for the promotion of international cooperation in the peaceful uses of nuclear energy, Ataul Karim said: "Bangladesh is convinced that if used in a planned manner with adequate care and caution, the nuclear technology can usher in a new era of progress and prosperity for the developing world ...

Already *in* the mid-sixties, before Bangladesh became independence from Pakistan (December 1971), there were talks of constructing a 125MW nuclear reactor at Itooppur. Suppliers included first USA, then Canada, then the Soviet Union and when that didn't succeed, France. Even Saudi Arabia was (in 1981) said to be willing to finance the whole project. But it didn't work out. Currently, one 3MW research reactor is in operation in Bangladesh. On 14 Sept. 1986, the Triga Mark II (supplied by the US company GA Technologies) became critical at Rooppur.

Sources: Asian Energy News, April 1996/ Statement by Mr. A. H. S. Ataul Karim, March 27, 1987/ Jahrbuch der Atomwirtschaft 1981 / New Scientist (UK), 8 Oct. 1981

Deinococcus Radiodurans Shall Inherit the Earth

IT IS almost supernatural. Deinococcus radiodurans, a nondescript bacterium first isolated in 1956 from a spoiled tin of meat, can survive several thousand times the does of radiation that would kill humans.

This has puzzled biologists for years, as no organism could have been exposed to such intense radiation under natural circumstances. But two bacteriologists in the US have now shown that D. radtodurans's remarkable resistance to radiation is almost certainly a by-product of its approach to surviving dehydration. Meanwhile, other researchers may have worked out how D. radiodurans defies death.

When it comes to withstanding radiation, the five known members of the family Deinocoecaceae have no rivals. Each bacterium carries several copies of its single loop-shaped chromosome. If exposed to between l0 and 15 kilograys of radiation over several hours, each copy sustains around 120 breaks that cut through both strands of its DNA. Other bacteria die if their chromosomes suffer just two or three such breaks, but D. radiodurans can repair its shattered chromosomes. "There's nothing else on Earth that can endure that kind of damage." says John Baton Rouge.

Battista and his colleague Valerie Mattimore realized that D. radiodurans's extraordinary DNA repair system must have evolved to mend DNA torn apart by some other extreme environmental stress. In a paper to be published in the Journal of Bacteriology, the researchers describe how they created mutant D. radiodurans by treating the bacteria with a chemical that 41 of these mutants had lost their ability to withstand radiation, and every one was also unable to survive desiccation. The other mutants, however, recovered after drying out. When the researchers examined the chromosomes of desiccated bacteria, they looked just as if they had been blasted by radiation.

The habitat in which D. radiodurans and its cousins evolved is unknown. They have been isolated from animal faces, Swedish underwear and weathered Antarctic granite. But Battista is sure that, like many free-living bacteria, they must have periodically endured periods of dehydration.

So why have other bacteria not evolved resistance to radiation? Battista says that most survive decision as spores, *in* which their DNA is wrapped *in* protective proteins. "Spores evolved to prevent DNA damage," says Battista. "Deinococcus, on the other hand, has hyped up DNA repair."

After dehydration, the bacterium has to rebuilt a copy of its chromosome from hundreds of fragments. Kenneth Minton and Michael Daly of the Uniformed Services University of the Health Sciences near Washington DC have found that'a key player in the repair job is an enzyme called RecA. This cuts and splices together overlapping fragments of DNA with partially matching sequences, and so can rebuilt a chromosome from random fragments.

In another paper that will appear in the Journal of Bacteriology, Minton and Daly report that deleting the gene for RecA in D. radiodurans destroys its radiation resistance. Replacing it with equivalent gene from a bacterium called Shigella Flexneri did not restore D. radiodurans's ability to repair its DNA. This suggests that D. radiodurans's RecA is usually efficient.

However, D. radiodurans repairs its chromosomes far more quickly than can be explained by the presence of one "souped-up" enzyme. Minton and Daly says that the pieces of radiation-damage chromosome must be held in their correct order to facilitate rapid repair. They treated D. radiodurans cells with a stain that illuminates DNA and found that its DNA is gathered into packets, as it the copies of its chromosome loops arc stacked up. "A lot of these packets look like doughnuts." says Daly.

Minton's and Daly's favoured theory, which they outlined in Science (Vol 270,p 1318), is that the chromosomes are anchored held alongside. These links are known as Holliday junctions. In higher animals, they normally occur during the cell divisions that from sperm and eggs, as an intermediate stage in the "crossing over, mechanism used to shuffle DNA between repaired chromosomes.

Microbiologists want to use bacteria to clean up sites contaminated with chemical and radioactive wastes. It should be possible, says Daly, to take genes that allow bacteria such as Pseudomonas to break down toxic chemicals and insert them into D. radiodurans. The result would be toxin-munching, radiation-resistance superburg.

Peter Aldons New Scientist 9 December 1995

A Technology Full off Unpleasant Surprises

The first meltdown experiment at the Phebus nuclear reactor in Cadarache, France, has come up with unexpected results. Part of the findings of the experiment have been released by the European Community, which funds 30 percent (900 million FF.) of the Phebus project. The full report on the first test is expected to be finished sometime in 1996, but , for commercial reasons, will not be released to the public.

The Phebus experiments consist of six meltdown in the core of the Phebus reactor in the nuclear research centre Cadarache. The goal is to find out whether computer models for meltdown accidents in nuclear reactors are still valid or corrections to these models have to be made.

It took a long time before the first meltdown start on December 2, 1993, as the French nuclear safety authority DSIN worried about a possible steam-fuel cladding reaction. Explosive hydrogen gas is formed in such a reaction, which starts at a temperature of 1200 degree Celsius. Meltdown was finally achieved when the temperature reached 2840$C. The test was interrupted when the fuel threatened to melt through the first barrier. Some days later, a defective safety valve burst, releasing 5 mill Curies of radioactive gas into the air.

One the unexpected results of the first Phebus experiment was that the fuel melted much earlier- It started melting at a power capacity of 50 kilowatt instead of the expected 90 kilowatt. Another unexpected result was that the melting process took place in a bigger core area. The unexpected results gave rise to uncertainties about the project for a time and have led to the postponement of the second meltdown experiment from the original target date of January 1995 to March 1996.

A Dutch physicist involved on the Phebus project believes that the construction of the Phebus reactor itself could be the very reason for the unexpected results. According to him, the meltdown occurred earlier than expected because the transport of heat from the core was too low. He doesn't think that international computer models now often used, like the ones from the Sandia National Laboratories (US), will be changed. "The core could melt two times faster than expected. But WHEN it melts, it doesn't really matter if it goes twice as quickly than expected."

Nuclear power plant owners and others in the nuclear industry fear that the Phebus experiments may provide new insights on meltdown risks which could lead to stronger safety requirements for nuclear plants. Stricter requirements would of course mean more expensive safety measures.

Unlike the first Phebus test, which was conducted with unirradiated fuel; the March 1996 test will be conducted with irradiated fuel, which will come from the closed Belgian BR-3 reactor. The test will be used to gain more insights on the melting of embrittled fuel and the spreading of radioactive materials from it. The project is slated to be completed around 2002, unless new uncertainties arise.

Source: Volkskrant (NL), 3 Febr, 1996; PT Weekblad (NL), 17 Dec. 1993; Standaard (Bel), 4 Dec. 1993.

X-Rays: Unnecessary Overexaminations can Kill

Russia tries to reduce irradiation deaths

One of the good measures which the previous chairman of the Atomic Energy Regulatory Board took was to try and regulate the mushrooming growth of X-ray clinics with no proper equipment, procedures or shielding of technicians and passers-bye alike. However, this is a gigantic task and needs far greater effort than has teen directed at it till now.

Russian citizens are to be issued with "radiation passports" to try to reduce the number of deaths due to overirradiation. In Moscow alone 8000 people die every year of cancer, radiation sickness, or reduced immunity directly related to too many x ray examinations, according to Dr Roman Stavitsky, a senior medical officer who heads a laboratory investigating the subject.

Dr Stavitsky blamed the thousands of dcaths_which include deaths due to diseases related to cancer in subsequent generations_on faulty equipment, outdated attitudes to health care, inadequate training in hospitals and x ray departments, and inadequate shielding from radiation. Russians undergoing routine medical checks are exposed to radiation levels up to three times higher than those used in "civilised countries," he claimed. There are not enough health experts to cope.

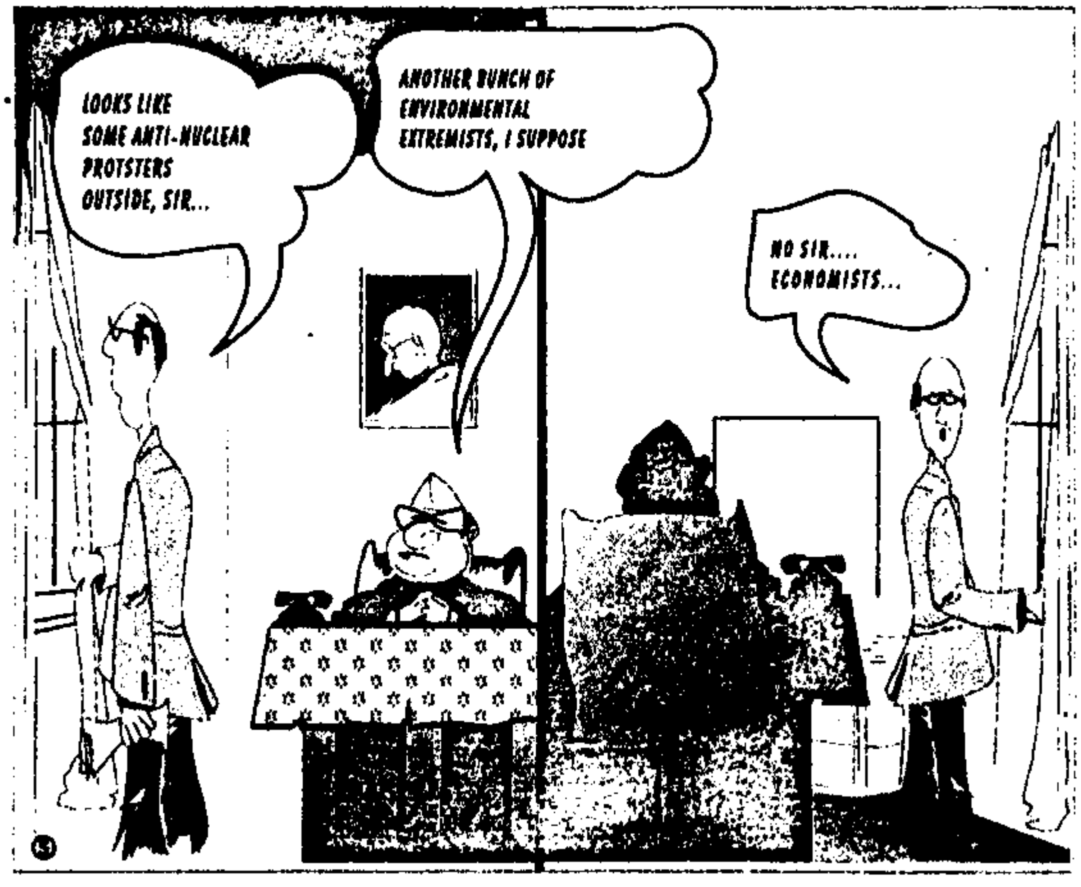
When Russia was part of the Soviet Union all adults had regular lung x ray examinations to screen for tuberculosis. Although this practice was stopped a few years ago, over half of Moscow's adult population had an x ray examination of some kind last year.

Officials in the city health department say that a new health care system introduced in 1992 encourages x ray examinations and that the number of x ray procedures and examinations that are unnecessary has doubled.

Sergei Okhrimenko, deputy head of a city department that checks radiation sources, said, "We consider this a big problem, all the more so since it happens in a country which suffered the Chernobyl catastrophe."

The passports are the brainchild of Moscow's senior radiologist, Yury Varshavskiy who plans to set up a new diagnostic and co-ordinating centre, which would enable people a to keep a check on their exposure to x rays.

Miranda Ingram, Moscow bureau chief, The European British Medical Journal


LOOKS LIKE SOME ANTI-NUCLEAR PROTSTERS OUTSIDE, SIR...
ANOTHER BUNCH OF ENVIRONMENTAL EXTREMISTS, I SUPPOSE
NO SIR.... ECONOMISTS...

A Doctor's View of French Polynesia

The land is like our mother. People come from the land.
We must always respect our mother, not explode bombs in her belly
Our good way of life comes from the land.
Destruction of land will lead to destruction of life.

JACQUES IHORAI, president,
Evangelical Church of French Polynesia

"Nuclcar testing ruined the country," says a French doctor. We met on the docks of Tahiti, watching Greenpeace's ship, Rainbow Warrior, depart for the atoll of Mururoa. "Not only by contamination of the environment with nuclear fallout or leakage of the residue in the bottom of the atoll, but far more by disrupting the social harmony of the country," he continues. "The country was self sufficient before the testing started; people subsisted on farming and fishing. Nowadays the state is entirely dependent on France. Imports exceed exports tenfold; il is an artificial state: approximately 15 percent of the population work as civil servants. Migration, loss of cultural values, degradation of agriculture, change in eating habits, prostitution, alcoholism, and mental illnesses are all the result of this. This country is addicted to Prance. Since the moratorium on the testing, the people have been forced to think of a future without France. Resuming the testing is like giving an addict who recently stopped using drugs another shot. France has the obligation to leave behind a state that is self sufficient and not a wreck with a long term legacy of nuclear waste, I can show you files of patients who died of radiation, but I guess you are more interested in public health aspects. Well, the cancer register you might look for doesn't exist: not kept, or hidden, who knows? Anyway, inaccessible for us. Don't forget that until 1984 most practising doctors here were military people. It is no coincidence that the doctor supervising the atolls of Tuamotu, where the test site Mururoa is situated, is still a military doctor."

French Polynesia is an archipelago of about 130 islands, situated in the Pacific halfway between Australia and South America (map). The territory covers an area as big as Europe. Although its population is only 200 000, the country is well known to the world, mostly for its paradise-like scenery. The crew of the Bounty simply refused to sail on and settled on one of the islands. Who has not dreamt of retiring on a distant atoll, inhabited only by some friendly natives, subsisting on fish and coconuts? Jacques Chirac's announcement of the resumption of nuclear testing on the atolls of Mururoa and Fangaiaufa, in the extreme south east of the archipelago, has stirred not only the archipelago but also the world.

As an overseas territory, French Polynesia has an autonomous government, but it depends on France for defence, justice, finances, and foreign affairs. The islands of the archipelago have a volcanic origin. Tahiti, on which half the population lives, is the largest. The smaller islands are atolls; the volcano sank and coral was deposited on top. This coral is visible as a rim above sea level, surrounding the inner lagoon. After Algerian independence forced France to stop nuclear testing there, the French decided that the Pacific was the most suitable place to continue, conducting 44 atmospheric tests up to 1976. Thereafter they performed 110 underground tests, drilling boreholes 800 metres into the basalt of the volcano. It is presumed that the nuclear waste after the blast remains safe in the basalt and does not migrate into the environment. Ironically, Mururoa means place of the great secret in the local language.

A child without an anus

We decided to visit the country to assess the effects of the testing on the health of the population and to see whether this necessitated a humanitarian response. Papeete, the capital, is a small town of about 40 000 inhabitants. It is difficult to keep a low profile. In no time at all the journalists arc alter us. Rumours pop up: we have been sent by the French government; we have boarded the Greenpeace ship Rainbow Warrior to sail to Mururoa. On the street I speak to a woman; she tells me that her child was born without an anus.. "The child was operated in France, but I never got the results of the investigations. They keep the diagnosis secret, they hide the results, sir. There are more children born without an anus," she says. I'm told by another woman that there are 15 000 handicapped people in the country. I try to, calculate a figure for a quick reference; but who defines handicapped? "We can organise for you to meet people who still suffer from skin diseases, body pains, children with short arms, all due to the testing," a delegate of the local union tells me. I'm not really interested at this stage in a paracie of incurable patients. It seems important to obtain objective data but it is difficult to break through the hysteria of the information.

The high commissioner promises openness; a visit to the site is, however, impossible at this stage, He hopes we understand, He explains some rumours. Radiation is higher in Europe; Australia is nearer to China (which also does nuclear tests) than to Mururoa; and there have never been illegal burials in France. In no time a couple of meetings with local authorities are scheduled. We visit the department of public health and ask directly about the rumours, is the incidence of cancer higher due to the testing? Are evacuations to Paris done secretly? Are there more congenital malformations than in other countries?

The cancer issue would seem easy to answer, but not in Polynesia. "The register started in 1985; before that time no systematic collection of data existed," the official tells us. "But, no problem, if there would be more cancer due to radiation we would find out now, because it has a time lag of decades before cancers develop. Cancer ranks number two on the top five mortality but one should not forget that the population grows older; now the life expectancy at birth is *66* years for men and 72 for women. Furthermore, the lifestyle has changed completely." Indeed the number of obese people in the street is striking. There is no register for congenital malformations in the counlry_difficult to believe for a country in which nearly all women deliver in hospital. If data for the general population are lacking, what about data for the groups at risk: the site workers, in thousands; the military; the people living on nearby atolls who have supposedly been exposed to high nuclear fallout during the atmospheric teste? "The surveillance of the workers is the responsibility of the employer," states the official. Me cannot provide follow up on the issue. "The follow up of the people on the nearby atolls is difficult. There has been considerable migration, how to find the original group? it is too expensive and laborious. We have more pressing issues to address. Road accidents are the number one killer, especially among the youth. In fact we have the highest standardised number of deaths due to accidents in the world. We work hard and we have made progress, but we cannot do everything at once. We have made good progress with health over the last few years."

Indeed, an extensive network of health posts covers all atolls. Most of the atolls are connected by a direct telephone system; if necessary, referrals by plane can be made. The country has 300 doctors and in Papeete there is a referral hospital equipped up to European standards. It seems, however, that the costs of this system are not sustainable without outside help. The contrast of the high level of care and the embryonic stage of data collection for the population at risk is striking and makes one suspicious.

A clinician we speak to later explains that there is serious underreporting of the number of thyroid cancers. "Thyroid cancer is far more common than reported and we definitely see it more than in France. This is not necessarily related to radiation but may be caused by goitre. Goitre has a high prevalence in the area; it already appeared in Gaugin's paintings."

15 000 litres of coconut milk

The next day we visit the nuclear protection and safety institute. "Surveillance is done of the environment and the food chain for the whole of Polynesia," the director explains to us. Later it turns out that they test food everywhere in Polynesia except for the test site. "The test site is not permanently inhabited and no food grows there," we are told. It still seems strange. We are oversaturated with figures. "One has to drink 15 000 litres of coconut milk from Tahiti to get the maximum intake of caesium 137." That seems difficult indeed. "The food with the highest radiation is being imported, Milk powder from Europe, contaminated after the Chernobyl incident, or mineral water with natural radiation yield the highest activity," he continues. The grays, curies, rems, and their modern successors sieverts and becquerels are all within reasonable limits.

Another representative walks in: "1 have worked for over 20 years on the atoll and swum there everyday in the lagoon." We understand that the dose of radiation due to underground testing, as they measure it, is minimal. But has it ever been measured by independent scientists? The three independent studies to investigate the atoll that have been permitted by France have all suffered from the same restrictions: too little time, limited access, and insufficient provision of background data. And what is the long term outcome of the nuclear residue in the bottom of the atoll? It is difficult to imagine what is actually tested; is the hole definitely sealed off, why don't they test even deeper than the 1000 metres they reach now, do they work on the cavity left by the explosion, are all the test holes connected? The answer seems loo simple to be true: "The load is sealed off by the process itself and that is it." The opinion of the officials on the follow up of the workers is also simple: "We have no right to check on people after they quit their job. The environment is surveyed and as long as the radiation is within limits, there is no need to check the people."

The military doctor we spoke to is a nuclear specialist and he too is convinced of the minimal effect of the testing on the environment. "The levels are so low that we have problems with the threshold limits of our detection equipment. No, the environment will not suffer; there are even plans to make a national park of Fangataufa_the abundance of birds is striking." What about the risk of cancer for the workers? "The risk with such a low dose of radiation is not known, but difficult to imagine." he says. What about the follow up of the military? "There are only a dozen military people who received a maximum dose of 15 rem in one incident. Doctors, especially radiologists, obtain the most radiation in Polynesia."

Safe enough for the Cote d'Azur?

Not being able to visit Mururoa, we try to visit a nearby atoll. "Does the boat sail regularly?" we ask a man from Gambler. "Yes," he answers decidedly. "How often?" "Every month." "And returning?" The man looks puzzled by the question, He shrugs: "The next month of course." The journey is abandoned. The rally tour of officials has rendered useful information. The actual radiation from underground testing seems small. But all these figures are provided by the authorities. Why don't the authorities allow in depth research at the atoll by independent scientists? This could effectively counter all the hysteria. Greenpeace never got permission to measure directly around the atoll. Their flagship was blown up by the French secret service in 1985, leaving one crew member dead (and the two secret agents sentenced to jail for 1.0 years). Many Polynesians say "It* the testing is that safe, why don't the French do it at the Cote d'Azur?" Minimal radiation into the environment doesn't exclude all risk. In Chernobyl too the authorities would tell you that the risk was zero. The risk of an accident can never be excluded, In 1985 the load exploded halfway in the shaft at 400 metres; in 1981 a typhoon hit the island, throwing a cement slab, and the nuclear waste that was stored underneath, into the lagoon. The outcome of the nuclear residue in the bottom of the atoll on the long term is unpredictable. Will it not leak and contaminate the environment?

The lack of follow up of the people at risk is a serious omission. 1 cannot state that all tests should be banned_some people argue that the nuclear threat kept the post-war world in a peaceful balance. Minimal ethical standards should, however, be adhered to. Polynesians shoulder a heavy burden of the testing. In 30 years their society changed from a "subsistence paradise" to a money driven society dependent on France. Before, the inhabitants lived on fish; now croissants seem the staple food. This process has brought progress, but has it brought happiness? il is the moral obligation of the French government to pay attention to these aspects and invest in forming a stable society, instead of leaving behind_along with the kilos of radioactive material in the soil_a crippled society. Active follow up of workers and people being exposed to a high level of nuclear fall out at the time of the atmospheric testing seems indicated. This is extremely laborious but not expensive compared with the actual testing. If the French insist on continuing the testing they should take full responsibility for the programme and do everything to protect the local population from the side effects of a show they never asked for.

Source: Hans Veeken, in British Medical Journal (1995) ;311:497-9

Subscription Information

Rs. 30/- per year (6 issues) (within India)
U.S. $ 15/-- per year or equivalent in other currencies for airmail overseas.
lis. 500/- for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on otherdrinks, please add lis 10/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Published by S.Gadekar for Sampoorna Kranti Vidyalaya and primed by him at The Parijat Printry, Ahmedabad.

PRINTED MATTER

ANIIMUKTI

A Journal Devoted to Non-Nuclear India

Volume 9 Number 5/6 **April/ May/ June//July 1996**

They didn't register us

To Vassily Deomidovich Dubodel, who passed away in August 1988,

and to all past and future victims of Chernobyl

They did not register us and our deaths were not linked to the accident.

No processions laid wreaths, no brass bands melted with grief.

They wrote us off as lingering stress, cunning genetic disorders...

But we are the payment for rapid progress, mere victims of someone else's sated afternoons

it wouldn't have been so annoying for us to die. had we known our death would help to avoid more fatal mistakes and halt replication of reckles deeds!

But thousands of 'competent' functionaries count our souls in percentages, their own honesty souls, long gone

So we suffocate with dispain they wrote us off.

They keep trying to write off our ailing truths with their sanctimonius lies.

But nothing will silence us even after death, from our graves we will appeal to your conscience not to transform the Earth into a Sarcophagus!

A Special

Lyubov Sirota

Issue on

ar Thinking

Go ahead! Break somebody's leg. You haven't caused him any harm.
After all, given time the victim can recover, and that according to the nuclear establishment (the International Atomic Energy Agency and the International Council for Radiological Protection), means that he has not suffered any "detriment" and hence he or she should not receive compensation for "bogus" complaints.

In their way of seeing things, any illness or damage done to the individual is not a "detriment" if the individual can recover with time. Thus, liquidators in the Soviet Union who received high radiation doses and whose blood counts are just beginning to become normal after suffering ten years of debilitating damage to the immune system, did not suffer. Similarly all those who suffer non-fatal cancers due to radiation do not have a detriment.

Only "severe" (another value judgement) genetic disease in live-born offspring is a detriment. Embryonic or fetal loss does not count neither do still—births or congenital malformations which are labelled by these worthies as non—severe and non—genetic. Death after the first two weeks of exposure to radiation, cannot be attributed to it. Nor can any death in which the victim did not have a verified acute radiation dose. No cancer can be attributed to radiation unless it has the approved latency period of ten years after exposure. Radiation promoted or accelarated diseases do not count.

Victims produce scientific paper after paper trying to prove the harm caused by radiation and hoping for their "acceptance" by the "recognised" authorities. These agencies just smile and stick to their value judgements. I mink we must begin to ridicule these value judgements rather than strain to keep proving the obvious. It has to be recognised that health effects of radiation are human rights issues They are not just technical or scientific issues.

Rasalie Bertell

From the Editor's

When Will They Ever Learn?

Chernobyl was a disaster, right? It definitely was so for the people. People suffered and are still suffering the consequences of the worst industrial disaster in history. People not only of Ukraine, Belarus and Russia, but even of distant lands where the winds blew and fire rained down. In these times of "free trade" and freer conscience, no place is really safe from the long lasting poisons disgorged by the accident.

But for some folks, the disaster at Chernobyl has been not a disaster but a marvellous opportunity to make more money and continue their power games. These folks are the guys in companies like Siemens, Framatome, GE, Wesunghouse, ABB and the like and their cronies sitting in government ministries all over the world but especially in countries with heavily centralised decision making.

The latest news on Chernobyl is that G7 and the European Union have signed a memorandum of understanding in which they have agreed to pay money to Ukraine to complete two unfinished Russian built reactors in exchange for shutting down the reactors at Chernobyl. Yuri Kostenko has been the Ukrainian minister in charge of the Chernobyl clean up and replacement power negotiations. He is also a candidate to become the director general of the International Atomic Energy Agency. No wonder, he finds nuclear energy as the cheapest and best option for Ukraine. Like some lepers in Indian cities exhibiting their sores to collect money these Ukrainian officials have been trying to extort huge amounts of money (two billion dollars every year for the next 20 years) by playing continuously on Western fears of Chernobyl.

It is indeed a wonder and a sad commentary on our times, that an accident which should have shut down nuclear industry world—wide has instead been used to support its revival, while the victims are left high and dry. What it shows is that how well the nuclear lobby is organised and how it has managed to control the debate Small, isolated antinuclear groups cannot fight this monster adequately. We need to recognise that nuclear industry is a global lobby which requires a global coordinated response.

In this issue we examine the various failures that led to the accident at Chernobyl and also the reaction of the authorities to the disaster and the myriad ways in which the accident was 'managed'. We compare the Chernobyl scenario with the present Indian nuclear scene. This is all the more relevant at a time when Indian political establishment is hoping to become a Santa Claus of the nuclear industry.

Some readers may find difficulty in comprehending the article "The Impossible Nuclear Explosion." It can be skipped on a first reading. We will supply interested readers who write to us the full text along with a glossary which might help in better understanding. However, its conclusions are important: firstly that the explosion at Chernobyl was a nuclear explosion and secondly that no containment in the world could have withstood it. This simple fact, that nuclear energy cannot be made safe by building bigger containment walls, has totally escaped not only the leaders of G7 and their Ukrainian counterparts but even supposedly hard-nosed bankers.

We are extremely sorry for the long delay in the publication of this issue.

5&6

The Reasons Why

In 1989 the Supreme Soviet of the USSR created a special commission to study the reasons of the Chernobyl accident and to examine the actions of authorities after the accident. Included in the commission were about two hundred experienced specialists from different branches of science from the three republics which suffered most from the Chernobyl accident (Belarus, Ukraine, Russia). Deputies of the Supreme Soviet of the USSR from these republics also took part in the activity of the commission. Expert subgroups studied 15 operating reactors of the RBMK' type at Leningrad, Smolensk, Kursk and Chernobyl nuclear power plants. They also collected, analyzed many materials possessed by different organizations and departments of different republics. Ordinarily these materials were not freely available and access to them was denied.

Conclusions of the experts

The primary cause of the accident was violations of rules of nuclear safety in design and construction of the reactor by scientific supervisor and Chief Designer of the station.

The main shortcomings of the reactor RBMK-l000 are:

- high positive void coefficient of reactivity;
- imperfect construction of rods of the reactor emergency system

The emergency situation in the case of the Chernobyl accident was aggravated due to low standards of the regulatory and technical documentation that could not provide adequate understanding to the operators of neutron and physical characteristics of the core of the reactor.

RBMK type reactors were in service since 1973. Several local emergency situations occurred: accident at block 1 of the Leningrad NPP in 1975 during which 14 fuel elements were destroyed; accident at block 1 of the Chernobyl NPP in 1982; failed critical starts of blocks 3 and 4 at the Chernobyl NPP 1981 and 1983 as well as failed critical start of the block 1 at the Ignalinskaya NPP in 1985. Adequate lessons were not learnt from these situations and the shortcomings they highlighted were not corrected.

As can be seen from the above the most serious flaws which led to the disaster were systemic faults. The actions of the operators, (who perhaps because of their thousand years of reactor experience felt that nothing could possibly go wrong) precipitated the already present deficiencies of the system into a disaster However, the immediate reaction of the authorities as well as nucleocrats all oyer the world was to blame the operators.

A Litany of Lies

Lies about Chernobyl started long before Chernobyl became a household word. For a flavour, the following quotation from *Bulletin of the International Atomic Energy- Agency* (Volume 25 Number 2, June 1983)

"The design feature of having more than 1000 individual primary circuits increases the safety of the reactor system-a serious loss of coolant accident is practically impossible." The Safety of nuclear power plants in the Soviet Union is assured by a very wide spectrum of measures, the most important of which are:

- "High quality manufacture and installation of components
- "Checking of components at all stages
- "Development and realisation of ways of localising radioactivity released in case of an accident
- "Realisation of technical and organisational measures to ensure safety at all stages of construction and operation of nuclear power plants"

The accident at Chernobyl on April 26, 1986 demonstrated that all these statements were just plain lies. They had been made by authoritative scientists who were not supposed to be liars, but in their enthusiasm for the technology they got carried away.

A lie repeated often enough and with enough authority becomes the truth. India has no dearth of our own chhota Goebbels. Let us compare the above set of proven lies with what *"Nuclear Power and You"* a Department of Atomic Energy, Government of India publication has to say about the safety of Indian nuclear plants:

"With more than 70 reactor years experience behind us, we can modestly claim that our nuclear power plants offer the greatest possible safety measures on par with the best in the world. This is the result of the state of the art technology employed in design, manufacture and operation of Indian nuclear plants. Reactors are housed in double containment and provided with foolproof triple back-up systems. To guarantee almost no leakage of radioactive elements into the atmosphere."

Reality Check: Before Chernobyl, the Soviets had had more than a thousand years of reactor experience and not a mere seventy.

Finding Scapegoats

Twelve years alter Bhopal we have yet to apportion responsibility and punish anybody for the disaster. But then we are we. What about the Soviets? They did punish people and sentenced them to long prison terms. But this punishment was meted out only to the lowest rung: the operators. Even in the proletarian paradise, higher officials with contacts in the system escaped with light raps on the knuckles. Nuclear *biradari* from all over the world closed ranks under the aegis of International Atomic Energy Agency (IAEA) and helped in perpetuating the myth that the accident was due to the perversity of the operators.

Ready for all eventualities!

"Gennady Aleksandrovich and I have just been at block 4. It's an awful sight. There is a smell of burning and there is graphite lying around. Where does the graphite come from?"

The Minister turned to the director of the nuclear power station. "Bryukhanov, you reported that the radiation situation is normal. What is this graphite?"

"It is hard even to guess The graphite that we got for building the fifth block is all in place, whole. At first I thought that it was this graphite, but it is all in place. We can't therefore exclude an eruption from the reactor."

"We can't measure radioactivity accurately", Shasharin explained. "We had one radiometer but it was buried somewhere."

"It is outrageous! Why does the station not have the necessary instruments?"

"The accident wasn't in the plan. The unthinkable has happened"

From Grigory Medvedev: Chernobylskaya tetrad 1989

The following is an account presented by Dr. P K Iyengar, ex-chairman Department of Atomic Energy, in a public lecture at Bangalore on October 8, 1990, that is fully four years after the Chernobyl accident and at a time when the above mentioned conclusions should have been known to him:

"The accident was the outcome of an amazingly large number of violations. A technical description of the accident scenario reads like a saga of repeated attempts by the reactor protective system to prevent the accident, each one foiled by the operator. A very brief discussion of the accident, giving only the basic essential parts, is as follows.

"The accident occurred during a test. This test was supposed to be done at a power level of about 800 MW. The RBMK reactor has a positive void coefficient below 600 MW, and so it is not supposed to operate in this range. The operator forgot to enter 'hold power' at 800 MW before power reduction. As a result power fell and went to very low power levels. Frantic attempts were made to prevent this. In the process, more and more control rods were drawn out a many trips were disabled. Finally the reactor was brought up to 200 MW, which is a forbidden zone. The test should not have been attempted in this zone, but the operators went ahead anyway. As part of the test they shut of steam to one of the turbines. This led to a rise in the Primary Heat Transport systems pressure and simultaneously to running down of the pumps connected to that loop. In this highly sensitive region, all these factors combine to give a resultant value for steam quality. In this case, it turned out to be more voidage (bubbles) in the steam. Since the void reactivity coefficient of RBMK is positive, this started introducing positive reactivity, and the reactor went prompt critical (in ordinary language exploded). The proposed test was not a routine test, but a special one attempted in an operating power reactor without proper planing".

Reading this account, one is struck dumb, not so much by the pig-headedness of the operators, but by the perversity of the system which allowed such expensive and dangerous plant in the hands of ill-trained and obdurate persons. And the second question that springs to mind is why was the test so important that it had to be conducted in an operating power reactor at the end of its fuel cycle when its inventory of hazardous radionuclides was the greatest?

A familiar Tale

The following account from *"The Legacy of Chernobyl"* by Zhores Medvedev does throw some light on the vexing questions raised above.

According to the Soviet report, Reactor No. 4 at Chernobyl, had begun operating in December 1983. But this is only partly true. The construction of the reactor and all its systems was completed by then and it was launched (made critical in Indian nucleocratic terminology) on 20 December 1983. In the Soviet Union 22 December is a day of celebration for the workers in the energy industry. (This is the day when the profession is given press publicity and awards and bonuses are announced.) There is usually a long .interval between the launch of a new reactor (which runs for a short while on much reduced power) and its full commercial operation. The schedule normally prescribes up to 6 months of tests and repairs. It often takes even longer to test all the systems.

For purely political reasons (which certainly have nothing to do with safety), the administrators, engineers, scientists, workers and operators engaged in running the tests of Unit 4 publicly undertook to reduce the time taken for the tests and to put the reactor into full commercial operation ahead of schedule. Such undertakings arc usually made under pressure from ministerial and Party officials.

Completing a project ahead of schedule is a rare event in Soviet industry and it brings enormous rewards and benefits. The Soviet report to the IAEA acknowledged that turbogenerator tests to use rotation energy had been done - and had failed - at Chernobyl before. The original tests had probably been done during the launching period between 20 December 1983 to March 1984, when they were much safer and when they could easily be repeated. The only way that the time allocated for testing a new reactor can be shortened is by reducing the number of tests and postponing some of them.

Certifying that a nuclear power station is ready to operate is not a single act. Each system most be tested and officially accepted by the administration of nuclear power station from the construction and assembly teams. During the trial of Chernobyl officials in 1987, it was admitted that reactor no. 4 had been cleared for operation, although the safety tests relating to the turbogenerator had failed. The trial was held in camera and the full text of the sentence was not published. But it seems obvious that the acceptance document was signed on the last day of 1983 under pressure, in order to be able to declare that the works planned for 1983 had been fulfilled. In the Soviet system of planning there are annual targets based on a calendar year. If the station head Bryukhanov had not signed the act on 31 December 1983, thousands of workers, engineers and his own superiors in the ministries and committees would have lost bonuses, awards and other extras.

A Clear Conscience

"And since we couldn't do anything anyway, we had no problems with our conscience any more. If, for example, we were given an order to dig up the earth from the buildings to the fences: we just moved the fences and that was it Cleaning up just one part seemed like utter nonsense (as did the cleaning up of everything else while the power plant continued to spit out contamination), and so we simply decreased the measures of nonsense and started to fit our days in the categories of the comfort of this nonsense
Source: Tiit Tarlap Chernobyl 1986: Memoirs of an Estonian Cleanup Worker

It is now known that the experiment that was attempted on 25 April 1986 was part of the tests which had been left incomplete at the end of 1983 and beginning of 1984. According to the Soviet report on the accident, it had been found (probably in the tests during the launching period in 1984) that the inertia rotation of the turbogenerators was insufficient to provide high voltage current for long enough to fill the gap before the electricity from the diesel generators became available. It seems likely that the engineers responsible for the electrical parts of the project suggested some alterations to the magnetic-field regulator. It would take time to make the alterations but a promise had already been given that the time taken to do the introductory launching tests would be reduced. The people in charge probably made a simple but irresponsible decision -to postpone the tests until the next cycle.

This kind of practice is not unusual in Soviet industrial construction. Many industrial objects are accepted by the relevant government commission with a long list on incomplete elements and operations which the construction team promises to complete after the object has been officially licensed. If the commission takes a strict line and refuses to sign an act of acceptance, no one receives a bonus and basic salaries may be delayed. Everyone, including the government, is unhappy if the plan is registered as unfulfilled. The result is that it has become normal practice to accept as fully operational industrial objects that have not been completed to specification.

Using the inertial rotation of turbine rotors is an important safety device of RBMK systems. The three emergency diesel generators cannot be started instantly. Cold weather probably affects the time it takes to start diesel generators. For the Chernobyl generators, the specifications maintain that they require 15 seconds to switch on and a further 30—40 seconds to produce the en-

ergy necessary to run the emergency pumps.

A 50-second gap in the circulation of cooling water through the core might be acceptable if large amounts of fission products have not accumulated in the reactor fuel. But fission products generate residual heat even in the shut down position. The problem is that RBMK-1000 is a system with on-load refuelling. In other words, individual fuel channels can be removed and replaced if necessary without shutting down the whole reactor. And this means that in a mature reactor, there are likely to be both fresh fuel channels and many that are approaching the end of their natural life and have accumulated fission products. The cooling system serves each channel individually. If the water pumps are stopped older fuel channels may overheat and sustain damage very quickly. Thus anything that interrupts the pumping of cooling water through the reactor core is very dangerous. The intention of the engineers to complete the work that should have been done before unit-4 was put into commercial operation and to provide the turbogenerators with an important safety device is perfectly understandable.

Of course. *it*

It is well known that in India—the land of honest politicians and the steel frame officials, such shenanigans as described above are just not possible. Thus, it is a great surprise to recall that when Dr. P K Iyengar himself was about to retire as the Chairman, Department of Atomic Energy, unit-1 of the Kakrapar Atomic Power Station, was commissioned in a hurry despite the fact that the Emergency Core Cooling System failed the mandatory tests before the unit became critical. (See *Anumukti* Volume 5 No. 6 June/July 1992). In fact Mr. K. Natarajan who was the Chief Engineer, (Instrumentation and Control) and a member of the Kakrapar Design Safety Committee had specifically written:

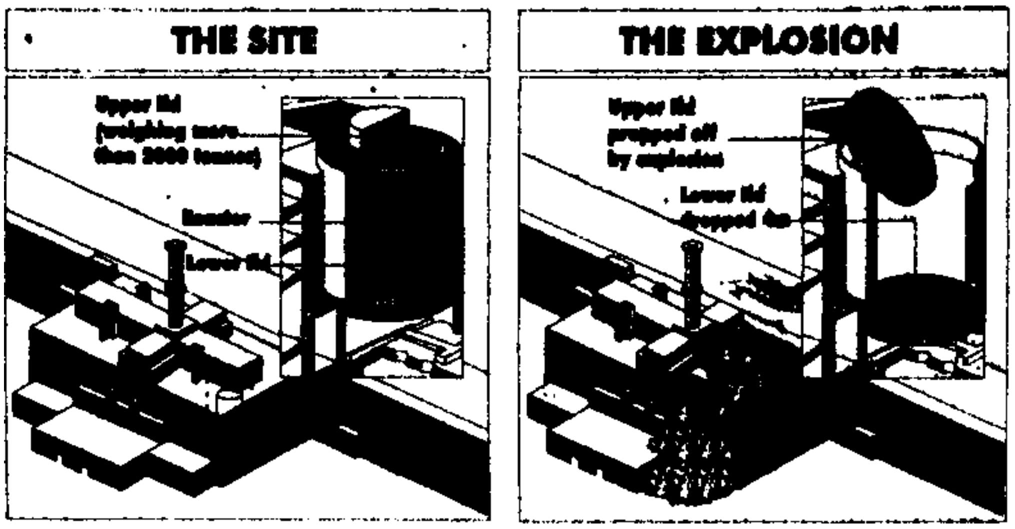
"The tests have been repeated and new operating points set. They are acceptable for KAPP-1 operation. However, a total integrated test with all the subsystems, components and logic functioning, should be done to confirm performance as per design intent in toto. *This must be done in KAPP-2 as soon as the system is ready and any retrofitting found necessary based on this test should be taken up for KAPP-1."*

At the time an annoynimous BARC scientist, who had sent this note to us, had written in his covering letter that:

"ECCS has no back-up system and it is hence essential that the system is fully tested before the reactor goes into operation. The integrated testing of ECCS is practically possible only once during the light water comissioning stage when the Primary heat transport (PHT) system is pressurised and heated up. Once the PHT system is filled with expensive heavy water, the integrated testing of ECCS is not possible since it involves light water injection into the PHT system. It becomes impossible once the reactor goes into operation and makes the PHT system highly radioactive, and misdeeds. This has almost become a culture in DAE." It is believed that actions by few top officials of this department who will be retiring shortly and hence would not be accountable for any future mishap are often responsible for irrational decisions"

After the accident the only people openly held responsible, were local plant officials and engineers. However, the government commission which must have been created to supervise the completion of the project, and which was obliged to check all the necessary tests before signing the licensing documents, must have consisted of competent high officials representing relevant branches of industry, the State Committee on Atomic Energy, the Ministry of Power, the Ministry of Medium Machine Building and officials of the fire protection services, representatives of ministries which manufacture turbogenerators, computer and control systems, representatives of the design bureaux and institutes which designed the project. One section of the commission would be people who had designed and built the project (they would have wanted an early completion date) and the other those who would operate it once it was tested and declared safe (they would normally want as little unfinished and untested work as possible to avoid future problems). If the relationship between the two was purely commercial, it would be impossible to cut too many corners or to cheat. But in the Soviet Union (as in India still) the groups represent different ministries but the same owner - the state. And it is normally state and party officials who try to find a compromise between the two groups. The compromise usually takes the form of an 'act of acceptance' which includes a list of incomplete tasks which the design and construction section promise to complete. All too often, however, the tasks are forgotten by the producers and must be completed by the consumers who were persuaded to accept the incomplete object, this is the rule throughout Soviet industry, from the building of apartment blocks or silage towers to the building of very sophisticated industrial projects.

The *impossible Nuclear Explosion?*


THE SITE
Upper lid (weighing more than 2000 tonnes)
Reactor
Lower lid
THE EXPLOSION
Upper lid propped off by explosion
Lower lid dropped

Schematic of the Damage Caused by the Explosion

Nucleocrats all over the world have repeatedly said that nuclear reactors cannot explode like nuclear bombs. This dictum has been repeated so often that even I had started believing in it. After Chernobyl a great deal of effort has been made to convey the impression that the explosion at Chernobyl was a steam explosion and a better Western type containment would have contained the damage. Below we present an analysis by D C Arnott and R D Green that clearly shows that there were two explosions and the second explosion was a nuclear explosion and that no containment in the world could have withstood it. In fact, the authors convincingly argue, that the fact that Chernobyl did not have a strong containment was a help, since the 2000 tonne concrete slab which covered the reactor core at Chernobyl and which was ejected during the first explosion, acted as a safety valve of a pressure cooker and thus prevented far more on-site damage from the second (nuclear) explosion,—Editor

Introduction:

In June 1990 an article appeared in *"Nuclear Technology"* called *"An Analysis of the Physical Causes of the Chernobyl Accident"*. The authors (Jose Martinez-Val et al of Madrid Polytechnic University Institute of Nuclear Fusion) cite results from extensive computer modelling based on the known Soviet data, from which the only conclusion consistent with scientific principles is that the primary cause of the destruction of Unit 4 on 26 April 1986 was a nuclear explosion. This contradicts the report of the British nuclear power establishment, which concluded that it was primarily a steam explosion. The Spanish analysis, drawing upon 46 published studies of the catastrophe, provides important evidence missing from the UK report. Also for the first time it unravels the mystery of why there were two explosions.

The official United Kingdom Atomic Energy Authority report on Chernobyl issued two years after the accident in 1988, was categorical on the point that the explosion at Chernobyl was not a nuclear explosion but a steam explosion.

"In essence, the Chernobyl accident was a steam explosion...triggered by a prompt-critical excursion. Responding to press reports that this amounted to a nuclear explosion, it goes to some lengths to deny such a possibility in any *reactor.*

The Chernobyl (RBMK) Reactor:

It will assist understanding of what follows if we begin with a brief description of the RBMK reactor design (see Fig.). This is additionally necessary because its radical differences from all other power reactors have led to misconceptions.

The core consists of a large assembly of graphite blocks which from the main moderator. This is vertically perforated by nearly 1900 tubes, most of which contain the fuel rods made of enriched Uranium oxide pellets clad in Zircaloy; whilst the remaining tubes contain the control rods.

Water, principally acting as coolant, flows upwards over the fuel rods, generating steam at the top of the core. The steam is fed directly to turbogenerators, after which it is condensed and recycled into the reactor. There is no secondary steam-raising circuit, tinlike the Pressurised Water Reactor (PWR). This defines the RBMK as one type of Boiling Water Reactor (BWR).

The fuel channels, also made of Zircaloy, are pressurised in order that the steam shall be hot enough for effective electricity generation. These channels also provide containment in the event of leakage of radioactivity from fuel cladding failure.

The rest of the core is enclosed in a leak-proof but unpressurised steel shell. Given the design, pressurisation of this shell is unnecessary. This has led to severe but misplaced criticism so important for our theme that it must be spelt out here. The misconception arises because UK thermal reactors are totally enclosed in pressure vessels which (like the RBMK fuel channels) also act as containment. But the pressure itself is not needed for containment: it is employed only because coolant, whether liquid or gas, extracts heat more efficiently when pressurised. However, loss of pressure in water coolant causes

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a phase change from liquid to gas, which drastically reduces its ability to absorb heat. This weakness played a major part in the destruction of Chernobyl Unit 4.

A final point, touching on the most difficult aspect of our analysis, will be helpful. It is that water is not only a coolant, it also absorbs neutrons and acts as a moderator. Loss of water in the RBMK, coupled with retention of the graphite moderator, thus contributed to the Chernobyl disaster.

It is estimated that about 1200 gigajoules of energy were released in Chernobyl eruption. 1200 gigajoules are equivalent to about 0.28 kilotons of TNT. That is more than the 0.25 kiloton yield of some warhead used in battlefield nuclear weapons. Thus the Chernobyl eruption was a tiny fizzle of a nuclear explosion in a device containing the potential fallout from roughly 100 Hiroshima and 100 Nagasaki.

Anatomy of An Eruption:

All accounts agree that about a second after Unit 4 went prompt critical, there were two explosions. The first involved a reactivity burst to about 100 times full power, which the analysis by Jose Martinez-Val et. al. of the Madrid Polytechnic University equates to a release of some 200 gigajoules of energy. Yet the prompt-critical excursion ended only after the second explosion, almost five times more powerful, had ruptured the fuel rods and dispersed enough of them by ejection upwards from the now-exposed core.

There is no dispute over what initiated the first explosion. As part of a mismanaged experiment, four of the eight main coolant pumps were shut down. The rapid fall in pressure caused water in the core to boil vigorously. Steam bubbles absorbed neutrons much less than did the water they displaced: with most control rods withdrawn to try to stabilise reactor power, the increase in neutrons raised reactivity: more steam resulted, and this "positive feedback" process caused a violent reactor runaway was checked only by the inherent Doppler Coefficient effect whereby, as fuel temperature rises, the neutrons available for fission are reduced, and with them reactor power. The Spanish analysis of what happened next:

"A few tenths of a second after the first power burst, the bulk of the energy (initially deposited in the fuel) was transferred to the water in a very fast, non-reversible process very similar to a steam explosion. The heat transmission rate from fuel to the coolant was so high that convective streams could not develop within the water. The steam film and bubbles produced (on) the (fuel cladding) surface grew and expanded much faster than the boiling of the bulk of the water. The internal pressure of the bubbles increased so rapidly that the water was suddenly expelled from the reactor. The 'dried-up' reactor was much more reactive than the wet one, and a second reactivity trip occurred...In any case, this second power burst was stopped only by the destruction of the reactor."

Clear evidence that the core was dry , before the second explosion can be found in Fig. IC following page 5.50 of the United Kingdom Atomic Energy Authority's (AEA) report.

Hence the first explosion occurred with the expulsion of water; while the second, which according to the Spanish analysis released about 1000 gigajoules of energy, was exclusively nuclear.

Attempted Refutation by Nuclear Authorities

The report brought out by UK Atomic Energy Authority (AEA) begins to try to justify its assertion that Chernobyl could not have been a nuclear explosion by describing a nuclear weapon-type explosion: "Weapons designers (achieve a nuclear explosion by) producing rapid increases in reactivity far beyond the 'prompt critical' state..In these circumstances the fission are due to fast neutrons, the time between successive fission is very short and massive amounts of energy are released before the material has time to blow itself apart and thus terminate the fission chain reaction."

It argues: "Such an event cannot happen in a thermal nuclear reactor..." (what is left unsaid is an implication that it can in a Fast Breeder Reactor, to which we will return)"...because the fissile material is mixed with a much larger amount of non-fissile material (Uranium 238) and also because (the) material rapidly disrupts (as it did at Chernobyl)bringing the fission process to an end...long before the reactivity reached the very high levels in an atomic bomb."

It is true that the structure and isotopic composition of the fuel in a thermal reactor differ from those of the fissile material in a weapon. That said, the same prompt neutron from U235 fission cause the chain reaction in a thermal reactor and in a U235 bomb. The difference is that the chain reaction is controlled in a thermal reactor by maintaining a balance between the supply of the neutrons available for fission and their absorption by (he U238 (and also by the water coolant in the RBMK design) or escape from the core. This balance is mainly achieved by a combination of increasing the efficiency of U235 fission through slowing down the prompt neutrons via the moderator (graphite in the RBMK), and adjusting the resulting reactivity level by inserting movable neutron absorbers— called control rods—between the fuel rods.

However, uncontrollably fast power-level changes would occur even for slight reactivity adjustment were it not for the fact that a tiny fraction (less than 1 % of the neutron supply is emitted after a delay of 1/10 seconds. This "delayed neutron fraction"—from fission products— is used by the reactor designer to allow slow enough reactivity changes for human control to be possible.

Radiation

The photo could be of a cornfield anywhere,
but for the two forlorn, elderly gentlemen
with Tolstoy beards standing in the foreground

The taller one to the right holds out
a loaf of a bread on white linen
embroidered with a crewel flower that's upside
down and hung over his unseen hands.
The man on the left is hardly taller than
what appears to be a bumper crop.

He holds a makeshift banner that could belong
to any hippie demo declaring MAKE LOVE
NOT WAR or LIVE AND LET LIVE,
but I can't
decipher the black banner's Belarussian.
The white letters look jumbled and words back
to front, reminding me of what 'live' becomes
when spelt backwards and what's hidden
behind everything these men live f
caught in a cornfield that could be

Greg Delanty

What happened at Chernobyl was that the operators managed to put Unit 4 into a condition where the delayed neutron fraction was swamped by an over-supply of prompt neutrons. This led to an uncontrollable prompt-critical excursion or power surge. All was lost when the water phase-changed to steam (a potentially fatal weakness in water-cooled reactors, as already mentioned). Neutron absorption was reduced, leading to a second prompt-critically. These effects combined to cause what amounted to a very small, inefficient, but entirely nuclear explosion, which only stopped when the core blew itself apart, ending the chain reaction.

The UK nucleocrats buttress their denial of such an eventuality with two more contentions. The report states: "In a power surge, even one in which a 'prompt critical' state is reached, the presence of the Uranium 238 would reduce the increase in reactivity by absorbing more neutrons as they slowed down— the Doppler effect. More Importantly, the majority of fission would be caused by slow neutrons."

Taking its Doppler effect point first, we quoted earlier from the Spanish analysis that th efficient effect would have been overwhelmed in Unit 4. The AEA may in fact agree because, when discussing the accident initiation elsewhere in the same report, it correctly states: "The void effect dominated the Doppler effect and made the power coefficient of the reactor positive.". The AEA thereby rejects its own first contention.

The AEA rates its second contention as more important: "...the majority of fission would be caused by slow neutrons." Here it appears to ignore the fact that "slow" (i.e. moderated) neutrons can cause prompt-criticality. The word "prompt" only indicates a lack of dependence on delayed neutrons. As we have explained, in a prompt-critical excursion any fissioning by delayed neutrons will be swamped by excess of prompt neutrons. Both contentions, therefore, are contradicted by reactor science principles.

The AEA states that such a process would be brought to an end"...long before the reactivity reached the very high levels of an atomic bomb." The Spanish analysis estimates that about 1200 gigajoules of energy were released in the eruption. One kiloton is 4200 gigajoules: so 1200 gigajoules are about 0.28 kilotons. That is more than the 0.25 kiloton yield of the W54 warhead fitted to a variety of US-battlefield nuclear weapons in the early 1960s; while the smallest fission warhead made—for a Special Atomic Demolition Mine—had a yield of 0.01 kilotons.

Of course, 0.28 kilotons is insignificant when compared to even the 13 kiloton yield of the crude and inefficient Hiroshima weapon. But what matters is that no containment could withstand it. This raise another point omitted by the AEA: it is well-known that reactors are much greater sources of contamination than weapons. The Hiroshima bomb contained about 15 kg of U235; while about 5 kg of Pu 239 were used in the Nagasaki device. The core of Unit 4 is estimated to have contained about 1500 kg of U235 and 500 kg of Pu 239 before it erupted, apart from a huge inventory of other very dangerous fission products like Iodine and Caesium. Hence the Chernobyl eruption was a tiny fizzle of a nuclear explosion in a device containing the potential fallout from roughly 100 Hiroshima and 100 Nagasaki.

In sum, the nuclear power establishment admits that an uncontrollable prompt-critical excursion occurred which ended only after dispersal of the fissile material, but tries to divert attention from the fact that this describes a nuclear explosion. It took the Spanish analysis to provide crucial facts (clearly available to the AEA) about the nature of the eruption to establish that Chernobyl was indeed the world's first nuclear explosion in a power reactor.

What was it like on April 26?

We have taken the following from "Inside the Beast" by Sergei Kiselyov from the May/June 1996 issue of Bulletin of Atomic Scientists. For the sake of brevity the article has been edited but we would urge our readers to read the original as well as the other articles in this issue of the Bulletin which is their Chernobyl special.

It is still so much easier to immortalise the names, of those who perished than to provide for the living. There are liquidation workers, inhabitants of the Chernobyl zone, and children who in the past 10 years have been exposed to monstrous levels of radiation. Unfortunately, the government remembers them only on anniversaries.

Most of the men I interviewed have remained silent for 10 years-not because they were scared to talk about what happened at the Chernobyl power station at 1:24 a.m. on April 26, 1986, but they have been more concerned with how to survive and how to provide for their families in these complicated times.

I interviewed many of them in their apartments. I was struck by the fact that their homes were all decorated "Chernobyl style," that is, in a somewhat provincial fashion. More striking still was the fact those who suffered the most from the explosion at the nuclear power station were convinced that it should not be shut down.

Yuri Korneev

Yuri Korneev was assigned to work at Chernobyl immediately after graduating from technical school in 1976. A turbine operator at Unit 4, he was on duty the night of the experiment that caused the accident. Today, Korneev is 39, married, and has two sons. He believes he was exposed to 710 roentgens.

The responsibilities of a turbine operator include making sure the turbine and auxiliary mechanism are functioning properly.

On April 26, precisely at midnight, I started my shift. I knew that an experiment was planned for this night at Unit 4. The seventh turbine was already taken off line, and the eighth turbine, which I operated, was next in line for shutdown and routine maintenance work. The internal energy experiment was supposed to be conducted on this turbine. Many turbine engineers, the chief engineer, and the shop superintendent stayed for the night shift to supervise the experiment.

An hour after I started my shift, the Unit 4 dispatcher informed me that the experiment was starting. I went to control panel, as I had to perform all the steps necessary for the shutdown of the turbine.

Usually, I went through a procedure without any problems. But this time something went wrong. At the moment the turbine stopped working, there was a sudden explosion in the area of the tubing corridor. I saw pieces of the reinforced concrete wall begin to crumble, and the reinforced concrete roof of our Turbine 7 began to fall.

In a few seconds the diesel apparatus kicked in, and emergency lights went on. I immediately looked at the roof of the turbine room. It was crumbing in layers. Falling pieces of concrete were slowly coming closer to my turbine.

It was all unexpected. It was difficult to figure out what was happening. The explosion and crumbling of the roof took only a minute, maybe even less. Right after mat, a shift supervisor, Boris Rogozhin, and the [now] deceased deputy chief engineer ran into the turbine room from the control centre. I was ordered to take care of Turbine 8 and not pay attention to anything else.

I will not go into technical details. Let me just say that I got lucky when, as a result of the explosion, the ceiling slabs fell from the reactor on the top of the seventh turbine room, which was turned off, and not on my Turbine 8.1 was also lucky when, a few minutes after the explosion, a multi-ton lead plug that closed a reactor channel fell within a meter of where I stood.

I was completely in the dark. The senior of turbine management knew nothing. The shift supervisor knew nothing. No one knew anything, and no one knew what had just happened. In the turbine room there was equipment that was supposed to start working when the radiation level increased. However, the level of radiation was so high that this equipment failed immediately.

While I was busy with the turbine, an electrician, Baranov-who later died in the hospital in Moscow-ran in and started pumping out the hydrogen that cooled the turbine generator. His actions prevented another explosion.

After everything, was done, an eerie silence fell on the turbine room. There

In Pripyat, animals crawled, half alive, in terrible pain. Birds looked as if they had crawled out of water unable to fly or walk. Cats with dirty fur, like it had been burnt in places. There were hundreds of dead birds and most of the animals were blind. Most pets, particularly dogs were later killed by special teams of soldiers. Kindness demanded it.

was small balcony; Baranov and I went out for a smoke. Underneath us in the street we saw pieces of Unit 4 and chunks of graphite thrown there by the explosion. Only later we realize what the radiation level was like on the balcony and how many extra roentgens we were exposed to during our smoke.

About two hours after the explosion I started to feel really sick. I had an acute burning sensation in my eyes, and they began to water. I was taken to the emergency room, along with Yuri Vershintn, the inspector on duty, who later died in the Moscow hospital.

On April 27, a bus whose seats and walls were covered with plastic took us to airport. A special flight brought us to Moscow, and the same type of bus picked us up at the Moscow airport.

I was in the hospital until July 14. I didn't have to have a bone marrow transplant, although there were willing donors. I was lucky; my body took care of itself. My diagnosis was radiation illness of the third degree. The highest level of radiation illness is the fourth.

Our locksmith on duty that night, Andrej Tarmazin, is the only man alive diagnosed with the fourth degree of radiation illness. His exposure was 860 roentgens; mine was only 710.

Incidentally, I didn't know this number after the accident; it was concealed from us. I only found out three or four years ago. The Chernobyl fireman who died in Moscow and were buried at the Mitinsk cemetery were exposed to over 2,000 roentgens.

I don't know how and why I survived. The doctors don't know either. In their reports they write that I do not have health complaints. They are right; I don't have any. The only thing is, I have two artificial lenses in my eyes, and my wife, on the other hand, is not feeling that. well. My younger son has stomach problems, the older one, heart trouble.

I haven't worked anywhere after Chernobyl.

Those who were at the station on the night of the accident get a lot of help from the current management of the Chernobyl power station. They have given us the extra money the government cheated us out of for the past 10 years. My pension today is about $250 a month. It's better than it was before.

Who is to blame for the accident? The operators were blamed for everything, and they still haven't been exonerated. But blame can be assigned [elsewhere}. The blame falls on those who built the station quickly, and those who claimed to have finished each unit before the deadline, communist-style. Blame probably also fall on those who organised the experiment on April 26, 1986. We received no instruction on that day, so cocksure were they that the atomic power station was safe and secure as an electric kettle. Nobody even thought it could explode. The people who were on duty that night, what did they do wrong?

During my visit to Pripyat I saw soldiers and officers picking up graphite with their hands. They had buckets and were collecting it by hand. They poured it into containers. There was graphite lying around everywhere, even behind the fence next to our car. I opened the door and pushed the radiometer almost onto a graphite block. Two thousand roentgens an hour. I closed the door. There was smell of ozone, of burning, of dust and of something else. Perhaps this was what burnt human flesh smelt like. Having filled their buckets, the soldiers seemed to walk very slowly to the metal containers where they poured out the contents. You poor dears, I thought, what an awful harvest you are gathering The faces of soldiers and officers were dark brown: nuclear tan. The weather forecasters promised heavy rain, and to prevent the activity being washed into the soil by the rain, people were being sent instead of robots, because there were no robots.

Grigory Medvedev

Nikolai Gorbachenko

Nikolai Gorbachehko, a radiation monitor at the Chernobyl station, was at work at the time of accident. He had worked at Chernobyl since 1976. Now 42, he is married and has two children and a three-year-old grandson. He believes he was exposed to 300 roentgens.

Radiation monitors at the atomic power stations are like scouts during wars; they come in first and leave last. The radiation monitor measures radiation levels in the workplace before the workers come in. After the shift is over, he measures radiation levels again.

My shift began at midnight on April 26. I had to take measurements in the reactor rooms of Unit 3 and 4, and check the data units. I checked Unit 3; but on my way to Unit 41 remembered it was in the process of being shut down, so I decided there was nothing for me to do there. I was really lucky that O wasn't at the reactor when it exploded.

I returned to my duty room to have some tea. Then we heard a flat and

powerful thud. My colleague and decided the turbine operators had produced a hydraulic hit, which sometimes happens during the shutdown of a turbine. At that moment we heard another flat thud. The lights went out; the light on the control panel of Unit 4 went out as well. Just as in a horror film, the blast blew out the double doors that had been latched. Black-red dust started coming out of the Ventilation vent. In a few seconds, the emergency lights went on. We put on our gas masks and tried to make a call, but the phone wasn't working.

We had dosimeters that measured up to 3.6 roentgens per hour. They immediately went off scale. My boss sent me to Unit 4 to find out what the radiation situation was like there. I went to the turbine room and walked around. It was pitch black, but I had a powerful flashlight. There were pieces of concrete everywhere. With my low-power dosimeter, I wasn't able to measure the radiation level. I returned to my post and told my supervisors what I'd seen.

Then two guys walked in. They said: "Hey. buddies, help us find a comrade of ours, Vladimir Shoshunok. He's been gone for 30 minutes and we haven't heard from him. He's supposed to be on the upper landing across from the turbine room."

So I went the two men to look for their comrade. In the darkness we made our way through piles of rubble, and went up to the landing. Everything was in shamble, steam was coming out in bursts, and we were up to our ankles in water. We made our way to the structure where the man we were looking for was supposed to be. We went inside and saw there was nothing-concrete slabs of the outside wall had been thrown to the street by the force of the explosion. It was night-darkness and dust everywhere. It was impossible to see anything. Even when you shone a light, the ray just vanished somewhere. We began to call to Valodya.

Suddenly we saw him lying unconscious on his side, with bloody foam coming out of his mouth making bubbling sounds. We picked him up by the armpits and carried him down. At the spot on my back where his right hand rested I received a radiation burn. He died at 6:00 a.m. in the Chernobyl hospital, never having regained consciousness. The two guys who looked for him with me later died in a Moscow hospital."

When I returned to my post, I put on dry clothes and changed shoes. As a radiation monitor, I understood what was happening and the fate that awaited everyone who was at the station that night. Then we received an order to look for; Valery Khodymchuk. Our search was unsuccessful. As we later learned, he died in the explosion.

At 5:00 a.m, I started to feel terribly weak and nauseous. I was taken to the hospital. A friend of mine, who worked in the emergency room, saw me in the waiting room. He took me aside, gave me 500 grams of pure alcohol, and told me to drink that.! drank it and washed it down with water. Then I called my wife and told her I was OK. Later on, the doctors told me that the alcohol, which I drank on an empty stomach, helped me a lot.

On April 26 there were already doctors from Moscow in the hospital. Seven or eight of the most difficult cases were flown to a Moscow hospital on the same day. They all died in that hospital. The rest went to Moscow on the following day. I was in the hospital for six months, from April 27 to October 27. It wasn't a pleasant sensation. You go to sleep at night not knowing whether you will wake up in the morning. Many died-often those who seemed to be getting better.

When I returned to Kiev in the fall of 1986, I received the lowest possible disability rating. I was given an apartment here, although I was also offered one in Moscow. I regret I didn't stay there. The Chernobyl workers who moved to Moscow receive a much better pension than we do in Ukraine.

I worked until 1991. Then it became too difficult and I retired. Although my disability rating was increased, my pension is small. My wife also doesn't work; she is sick. My children aren't doing well cither. Their blood tests are bad and they have constant headache. 1 check into the hospital twice a year for a battery of tests.

Yuri Andreev

In April 1986, Yuri Andreev was a senior engineer at Unit 2 at Chernobyl. He had worked at the Krasnoyarsk and Smolensk power station before moving to Pripyat in 1982. Since 1991, he has served as president of the Chernobyl Union of Ukraine, an advocacy organization for the thousands of Ukrainians who participated in the clean-up after the accident. Andreev is married, with two daughters. He believes he was exposed to 150 roentgens.

At the midnight on April 25, 1986, my shift ended. I left before Unit 4 exploded. I spent the night of the 25th-26 at home, and didn't hear the explosion. At 9:00 in the morning, my wife returned from the market and said there were rumours in town that there had been an explosion at the station. I told her I didn't believe it, and I took my daughter out far a walk. I saw the streets of our town Pripyat-with 55,000 inhabitants-bein

washed with a sudsy solution. There were also many police on the streets, and they were armed with automatic weapons. Although there were no signs of panic, everywhere beer and *Kvas* [a fermented low-alcohol drink] where being sold from the tap.

After I saw all of this, I decided to walk to edge of town, where I could see the power station, which is located two kilometers outside of Pripyat. I saw that there was only a wall left of the central building of the station, the one around the reactor. There was no roof, grey smoke was rising above the ruins. I understood immediately that reactor fuel was exposed to the atmosphere.

On the way home I noticed that there were a number of armoured vehicles from army chemical intelligence, and soldiers with dosimeters. I asked one of the officers what the radiation level was. In response, he hastily blocked the scale from view and told me to mind own business. One emergency vehicle after another headed from the power station to the city hospital.

On my return home, I didn't want to frighten my family, but I told them not to go out for any reason, and to wrap the shoes they had walked in today in wet rags and put them outside, and to conduct a through wet cleaning of the apartment.

My shift at the power station began at 4:00 p.m. [On the way to the station], the bus took a different route; it went on a detour past the cooling pond and the ruins of Unit 4.

I realized that what I had seen from town was nothing. I couldn't have imagined that something like this would ever happen. I saw parts of the reactor a person should see only once in his life-before the reactor goes on line. On the ground were pieces of the roof, thrown there by the force of the explosion, as well as drums from the separators, pieces of tanks from the emergency cooling system, and many other parts. It was obvious that the reactor was exposed to the atmosphere and "breathing." Toward evening you could see an even, dark purple glow above the active zone.

Our shift began with an order to shut down Unit 2. Everything started well, but then there was a glitch. During shutdown, the fourth turbine suddenly went off. Lights went out on the reactor's control panel. The alarm sounded. In a second the emergency light kicked in. But in this fraction of a second, I felt fully my helplessness before the nuclear machine. I felt with sudden intensity what my colleagues had gone through the night before, when they couldn't control Unit 4.

However, the shutdown of Unit 2 was successful, as well as the shutdown of Unit 1. [Unit 3 had been shutdown early in the day.]

The next day, April 27; the evacuation of Pripyat

Certainly Heroic, But Was It Worthwhile?

Colonel Nesterov, was the first to fly a helicopter on a 'bombing run'. He flew over the crator of the nuclear reactor. At 110 metres over the crator the radiometer registered 500 roentgen per hour. He could feel the heat from below. A mighty torrent of radioactive gas, ionized by neutrons and gamma rays, rose up. All this without respirators. The helicopter was not protected underneath with lead. They stuck their heads out through the open door to aim at the nuclear crater and threw the sacks. The first twenty seven crews soon had to be sent to Kiev for treatment. The pilots began to find it hard to breathe. Throwing sacks had a significant effect on the active zone. The amount of radioactive dust emitted rose sharply particularly on the first day. People breathed all this. For a month afterwards uranium salts and plutonium were washed from the blood of these heroes. On subsequent days the pilots themselves began to put lead sheets under their seats and to put on respirators.

Col. *Anatoli Kushnin*

Col. Anatoli Kushnin, chief of the chemical defence air force division. Kiev military district, served in the Chernobyl zone from April 26 to May 22, 1986. A member of the army since 1968, Kushnin graduated from the military Academy of Chemical Defence in Moscow in 1977. At the time of the Chernobyl accident, he was chief of the air force's chemical defence unit charge of Ukraine's Radiochemical and Biological Defence force. Now 46, he is married and has two daughters. He believes he was exposed to 130 roentgens.

residents began. My wife and children went to the Zhitomir region, where my wife's parents lived. I remained at the power station, as did all the station personnel. At first we were taken our shifts by bus, as before. Thus, during one round trip to work, we were exposed to 5 roentgens, the maximum considered safe as an annual does. Later we were taken to work in armoured vehicles. For a while after the accident, the station cafeteria was closed; all the stores in Pripyat were also closed. The town looked abandoned and frightening.

We were left to survive with an order to hold the station together. J didn't sec any outside help. We had no dosimetric devices; the once at our disposal didn't work. The most popular books for us at this time were whatever textbooks on haematology and civil defence we could find in the libraries. At least they provided some information on radiation and its doses.

I continued working at the Chernobyl power station until 1988. Then began having problems with my health. I fainted at my work station several times. Incidentally, to maintain secrecy all the medical histories from 1986 were destroyed in 1989. Station personnel received new medical histories that no longer contained the results of their 1986 blood tests or their diagnoses.

I found out about the Chernobyl accident on the morning of April 26, 1986, when I came on duty. The duty officer told me about the accident and fire at the Chernobyl power station.

First. I tried to find out what the situation was like at the station. I called the headquarters of the army's chemical defence forces for Kiev military region. The senior officer there informed me that the radiation situation was bad as a result of an accident, but that there was no precise data available.

In the meantime, the headquarters of the Kiev military region ordered an immediate transfer of pilots from Kirovogradsky region to the air field closest to Chernobyl . At 11:30 p.m. the regional air force commander, Major-Gen. Nikolai Antoshkin, and I drove to Chernobyl. We approached the power station by 2:30 a.m. A red glow was over it. We passed the station and went to the town of Pripyat. The liquidation [cleanup] headquarters were located at the city hall.

We immediately got to work. In order to put out the reactor fire, the decision was made to dump sand over it from above. It was necessary to form teams to fill sacks with sand, which we later dropped into the reactor core. Then we dropped lead into the reactor. There was a supply of boric acid at the station. We also dropped boric acid. Since the rods used in stopping a nuclear chain reaction are made of pure boron, boric acid could help to retard the reaction as well.

All this work fell on military pilots. At the time, there were 80 helicopters and air-planes of various types deployed in Chernobyl. Every officer in our on-the-ground provision group was responsible for various aspects of this job. At the head of the chemical service, I was responsible for radiation safety on the staff, for preventing military personnel from being overexpose, and for recommending appropriate safety measures. For example, I told the helicopter pilots to cover the floor of their machine with sheets of lead.

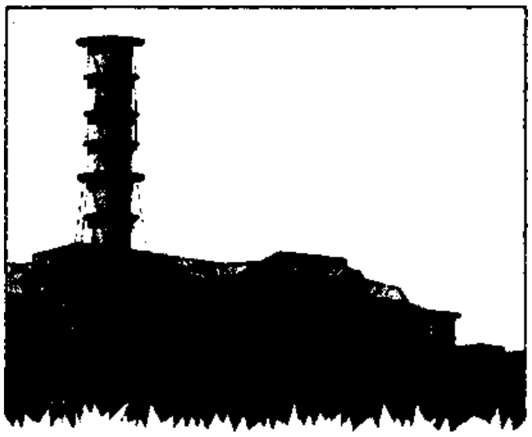
I was in Pripyat. The helicopter strip was located 11 kilometers from the reactor. I used a deserted military airstrip midway between these two points as a decontamination station for helicopters and pilots. Special technology was sent there. After flying above the reactor, helicopters were washed with special solutions and their crews showered and received new uniforms and shoes. The helicopters were returned to their base practically clean. Those machines that couldn't be cleaned remained within the 30-kilometre zone. We left helicopter engine, which couldn't be treated chemically, there as well.

Our military pilots worked zealously. I don't remember a single case when someone showed fear, a lack of discipline, or disobeyed orders. By May 4 the pilots had buried the reactor core in sand despite conditions that were difficult and dangerous. The dosimetric devices on these helicopters measured radiation levels of up to 500 roentgens an hour. In the first days after the accident those dosimeters went off scale. The crews were exposed to enormous radiation doses during their flights over the reactor. Pilots had to be substituted all the time; afterward, crews were sent to a military hospital in Moscow. Not all of them survived. Recently, military test pilot Anatomy Grishchenko died in the United States. He was the one who tried to lift a huge dome over the exploded reactor with biggest helicopter in the world, the MI-26. He didn't succeed, but he was exposed many times to huge doses of radiation. He wasn't even told about that for a while.

Everything to do with radiation levels was top secret. In early June 1986 I signed for a coded government telegram received from Moscow listing 13 pilots about the consequences of the Chernobyl accident. It included radiation levels, among other things. This coded telegram was signed by General Secretary Mikhail Gorbachev.

I was also exposed to a significant dose. I was hospitalised with symptoms of radiation illness. My situation would have been worse had I not taken certain precautions while in Chernobyl. I believe that cloth masks only protect respiratory organs from large radioactive particles of dust, not from radioactive isotopes, which permeate the air.

I saved my self with cigarette smoke, as strange as that may sound. Along with the inhaled smoke, isotopes of radioactive iodine entered the lungs; then they got absorbed in the smoke particles and were exhaled along with them. In short, I always had a cigarette in my mouth, believing that nicotine would be less dangerous than radioactive isotopes. My first blood tests confirmed that they didn't get into my body in the first days of work at Chernobyl. Doctors couldn't believe that my tests revealed no abnormalities.



Nevertheless, I can't call myself a healthy man today. My leg hurts, and I limp when I walk. Often I have headaches. I head the Chernobyl Union at the central office of the Ukrainian Ministry of Defence, which consists of military men who worked in the aftermath of Chernobyl. Among other things, our organisation procured the right for the officers who were at Chernobyl to retire five years before the legal retirement age, with a full retirement package.

I spend April 26 in a traditional fashion: I take a bottle of vodka and drink for those who perished at Chernobyl. However, I believe at this point the Chernobyl station should not be shut down. Its safety level right now is practically 100 percent. If so much has been invested in its safety, why take it off line?

Valery Starodumov

Valery Starodumov, a senior engineer working in radiation safety, arrived at Chernobyl on June 6, 1986. His group of cleanup workers of "liquidators" were known as the "rooftop cats," because they cleared the roof-and other areas-of the most dangerous materials before other workers came in. Today, Starodumov serves as chief of Ukrainian Department of Radioactive Waste Management and deputy director of the Ukrainian Government Committee on Nuclear Energy Uses. Now 52, he is married and has two children and a granddaughter. He believes he was exposed to 300 roentgens.

The day of my arrival at Chernobyl was my first day of work. When I arrived in the early evening of June 6, I found that there was no one to translate the operating manual for the two German robots, the F-l and F-2, that we needed to work on the remnants of the roof of Unit 4. It took me all night to translate the manual.

Until June 19, I worked on finding a place for a special laundry for washing and treating the clothes of the liquidators. I also tried to analyse the use of various protective substances and working clothes.

Then I was assigned to group of jokingly dubbed the "rooftop cats" by the other .liquidation workers. This group consisted of 32 nuclear experts, drawn primarily from military ranks; it was given assignments in the most dangerous and responsible areas. The head of the group, Yuri Samoilenko, later received the Hero of Socialist Labour medal.

The group's of primary responsibilities were verifying the structural integrity of buildings at the power station, evaluating radiation doses, identifying radioactive hot spots in certain areas around the power station, evaluating the possibility of removing fuel from the reactor taken off line, and other such tasks.

Later we evaluated the feasibility of doing certain kinds of work on the roof of Unit 4. On August 30, 1986, we removed the most radioactive objects on the roof with our own hands. We made it possible for the deactivation workers to enter the breach that we cleared. On this day each member of our group received a "hit" of radiation of 30-35 roentgens. But we were able to lower the overall radiation field at the entrance to this area from 1600 roentgens an hour to 800 roentgens. We did it by tossing the remnants of fuel assembly units thrown there by the explosion back into the reactor.

Army chemical defence units followed us on the roof and into other areas of the destroyed reactor. Many of them were exposed to high levels of radiation; I doubt that all of them are alive today.

All the mistakes that led to high radiation exposure of liquidation workers had to do with the fact that the people doing the work weren't professionals. If we had prepared those who worked on the reactor roof more thoroughly, if we had given them a year-better yet, three year-of preparation;if for this period we had conserved the station under dust-suppressing elements to avoid the release of radioactive elements into the atmosphere; we would have avoided the high number, of causalities and saved our genetic heritage.

In 1987 I was in the hospital from July to October. My hair fell but; three hot particles were found in my oesophagus and intestine. Since then I have not had particular health problems. The pension I received as a liquidator at the Chernobyl power station is laughable. It amounts to a little over $20 a month.

As far as the urgent need to shut down the Chernobyl power station, I think it's a made up problem, more political in nature than economic. The world says the station is dangerous because it is located so close to Ukraine's European borders. However, if you compare the location of other power stations-Smolensk, Kursk, and Ignalia-that have the same kind of reactors as Chernobyl, they will be found to be even more dangerous to the West. I think the main issue here is the fight for a piece of the energy market. Recently a map from Germany and Austria came to my attention. You can clearly see lines going system. The high-voltage line from Chernobyl stops in Austria-Chernobyl still exports energy and someone is interested in getting rid of competition in this market.

Source: Sergei Kiselyov. Bulletin of Atomic Scientists May / June 1996

Utter Confusion

It is hardly surprising that in a situation of complete blackout of information, a number of people responded to the rumours by rushing to leave via the road that led through the Red Forest'. Witnesses reported that along this road which was already 'shining' in the full force of radiation, women wheeled prams. There was no plan of evacuation and we did not know which blocks of Pripyat flats or which micro-regions had been placed in which villages. I still can't understand what scheme was used, who was sent where. I would phone a village council and ask "Do you have such and such parentSi their children are looking for them". And the reply "We have such and such children without parents." One would sit all day and phone all the village councils in turn.

Heroes *Then*, Zeroes *Now*

It took the Soviet authorities some time to realise the true extent of the disaster on their hands. When they did, there were frantic appeals from ministers for volunteers to fight the invisible enemy 'radiation'. Many did volunteer and there were many others who were conscripted against their will. What is life like for some of them and their families, ten years later.

Vika Troschuk

My husband was woken by an alarm on the night of 26 April 1986. He came home the next evening. He was one of the drivers for the military motorcade which responded to the accident. Both trucks and drivers had to wait for some time in the "auburn forest" but their dosimeters were broken so no one knew what radiation doses they had received.

In 1987 he suddenly lost his consciousness while driving and caused an accident. After that his health deteriorated and he spent a long time queuing at hospitals where no examination or medical treatment was available. In 1990, his health abruptly worsened. He spent six months in hospital having tests. He was diagnosed as suffering from nervous system deterioration caused by radiation and was registered as a second level disabled person.

In autumn of 1994, he got worse. An examination in the Kiev based radiological centre found that his liver was inflamed. But there were no medicines to treat him and he was sent home. He went to the district clinics complaining of pains in his spine and was transferred to a Crimean sanatorium. In March 1995, he was diagnosed as having cancer of the liver and he died in May.

I am 49 and unemployed. At my age it is difficult-almost impossible to find a job. Chernobyl public organisations paid for his funeral. That is all. The state that killed my husband does not see the need to support the family. So survive if you can.

Now Chernobyl has begun to cast its shadow over the life of my son, Ihor. In 1988—1989 he was on military service in Kovpyty, an area contaminated due to Chernobyl. Now, like my husband he is seriously ill. He is fading before my eyes and he does not even have the status of a Chernobyl victim. How can I, poor and stripped of everything help my son? Chernobyl took everything I had. We are now living like a piece of useless garbage on a human rubbish dump.

> *Chernobyl took everything I had. We are now living like a piece of useless garbage on a human rubbish dump.*

Vasiliy Osipovich Kotetsky

I began to have health problems in the first few years, but I attributed them to the first hard months of adapting to a new environment, to family problem, to problems of employment and residence, and other causes. But over the past three years it has become worse although I don not smoke or drink excessive alcohol. Both my wife and myself are now certified as level 3 disabled persons. My children (my son aged 16 and daughter nine,) also have health problems associated with the consequences of Chernobyl. We are a typical family of Pripyat liquidators.

There is no rehabilitation and treatment centre for the Chernobyl victims in western Ukraine. District doctors send us to different hospitals or to narrowly specialised medical departments. But our complicated medical problems need complex medical treatment. I do not remember a single day in the past two years that I have felt well. What can I do when my medical card repeated confirms: second grade encephalopathy, dolichostigma, gastritis, cholecystitis, chronic prostatis, haemorrhoids, functional troubles of the left heart ventricle and other "minor" conditions? What can I do when my wife and I have to often massage the legs of our daughter while she groans in pain trying not to wake her brother or the neighbours?

They receive us at medical facilities but often do not register our visits. Several times a year we are sent to the therapy department, the neurological department, to urology, or to surgery. But it is all a mere formality and does not really help.

It is difficult to get a sanatorium voucher. We have to visit a lot of officials and the state regulations on voucher distribution and compensation are amended every year. It takes a lot of time, effort and energy which is not worthwhile in terms of the medical treatment we receive or the improvement in our health. And it all costs so much. Where on earth are these free drugs? The system for distributing compensation and payments to Chernobyl victims is bureaucratic and an affront to human dignity. It is humiliating to show my certificates to everyone, to produce multiple copies of documents, to bow to every mandarin.

We want to see our children make their own lives. We want to give them a little happiness. That is the main purpose of our lives now.

Eugenia Dudrova

I was friends with Olga from our early childhood, as far back as I can remember. We were more than sisters-we were inseparable. We entered school together, studied in the same music classes, spent all our spare time together.

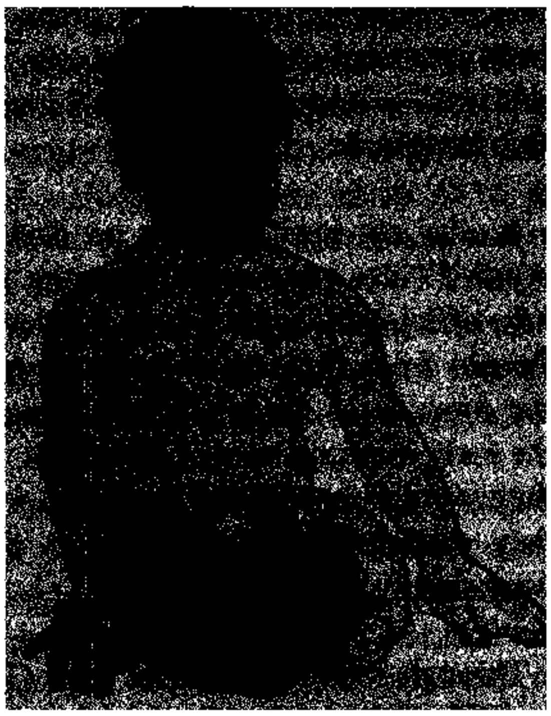
In the spring Olga felt worse and doctors found that she had sarcoma-a deadly tumour. Almost immediately they carried out surgery and she felt better for several days. But then the unbearable pain began again. Olga was very upset that she could not play piano for long. We had a dream to study in the conservatory after finishing school. You cannot imagine how determined she was to overcome her disease but she was soon in hospital again.

Olga's legs became paralysed and shortly after that her arms too. My mother told me that my friend would die soon. I could not believe it. I dreamt that one sunny day a miracle would happen and we would run home hand in hand away from that awful hospital.

But there was no miracle. She prayed for help but we could not help her. Doctors refused to give her morphine saying they were short of the drug and could not use it all for one dying person. One of the doctors told us to take the child to die quietly at home.

1 do not know how to live without her now. I know that I could never find another such friend. I have lost half my life, half of myself. Why did adults create such a disaster? We did nothing wrong. I and my friend were only three years old when the. reactor exploded. I wonder if I face the same fate?

Source: Testimonies:
Chernobyl Papers 1 Greenpeace



Containing the Uncontainable

A disaster is not just the initiating incident. It is also the response of the system to the original incident. Proper mitigation efforts can do much to reduce the effects of even serious accidents. As the following article shows, at Chernobyl many of the steps undertaken towards mitigation were of no help at all. Lack of previous planning and an overwhelming desire to hide the facts from the people were the prominent causes for the often unnecessary excessive radiation exposure.

Suppressing Truth Was A Greater Priority Than Helping The Victims

The Chernobyl accident exposed glaring weaknesses in the Soviet system: its backward technology, its sloppy safety standards, its inability to admit failure. It brought to the surface many of the injustices, inefficiencies, and secrets that the government "had tried to keep hidden.

Old habits die hard. Ten years after the accident, many bureaucrats in the former Soviet Union, particularly in Russia, are still too secretive and too much given to obfuscation.

Heroic, but ineffective

By the time of the Chernobyl accident, Soviet citizens had become masters at avoiding accountability for mistakes and failures. Perhaps no other statement quite capture the essence of this lack of responsibility as one allegedly made by a NIKIET specialist, whose organisation (the Moscow-based Scientific Research Institute of Power Engineering) designed the RBMK reactor series. When asked to aid in clean-up and mitigation efforts, he was widely quoted as saying: "This is no longer a nuclear reactor. Our expertise is in nuclear reactor...so let others clean it up."

And so began an accident containment and mitigation effort portrayed by Moscow as one of the most difficult and heroic engineering tasks ever undertaken. In reality, the period to the end of November 1986, during which the sarcophagus was constructed, was marred by an inept and reckless attempt to conceal the extent of the accident-despite the fact that unwitting "volunteers" (including former Soviet dissidents and political prisoners) risked their lives in several ineffective accident-management actions.

The Governmental Chernobyl Commission (headed by Deputy Chairman of the Soviet Council of Ministers Boris Scherbina) was formed during the morning of April 26, 1986, and in a manner that resembled a cry to arms, rallied major Soviet organisations and people to mitigate the consequences of the accident. It was clear from the start that no concrete emergency plans had been previously formulated-no one was prepared to respond to an accident of this magnitude.

Il was not until midday on Sunday April 27 that anyone in Moscow had any official idea what had happened. People from the station had surveyed the remains of the reactor building in the early morning hours of the 26th, but they were either afraid to report what they thought had happened, or they were simply not believed.

Through most of the first day, Gennady Shasharin, a key Soviet energy official, thought the core was being effectively cooled by water. Based on this and other incomplete information, the central authorities in Moscow did not immediately sense the urgency of the situation and delayed, for example, the evacuation of residents from what later became the 30-kilo-mcter Exclusion Zone. They didn't want to create panic.

Significantly more radioactivity was released into the atmosphere than Soviet authorities were willing to admit at the first major Chernobyl conference, the IAEA's Experts Meeting in Vienna, in August 1986.

This does not imply that during the active phase of the accident Soviet officials knew that the helicopter campaign had not covered the core. They almost surely believed that the helicopter crews had been successful. But the time of the August meeting, the officials had had ample time to examine the remains of Unit 4 and to conclude, as is obvious from photos, that the core had not been covered.

The scientific finding that the core had not been smothered after all undermines one of the central tenets of the official Soviet version of the Chernobyl clean-up campaign: the cult of the brave Chernobyl helicopter crews who took actions meant to put out the fire, and whose youthful deaths are honoured by a special museum in Kiev.

The Verdict of the

Disastrous consequences of the Chernobyl accident:

- A huge territory (up to 160 thousands square kilometers inhabited by over 9 million people) was contaminated with long-living radionuclides
- Big part of arable land was excluded from economical activities
- Millions of people received significant doses (the collective dose of Soviet soldires that took part in liquidation of the Chernobyl accident in 1986—1988 was higher than 2.64 millions manrem)
- 190,000 residents of the affected areas had to be relocated to clean areas
- There was a sharp increase in somatic and oncological (children's thyroid cancer) diseases; also there were phyetiological stresses that have significant influence on social-physichological state of population.

It is now recognised by specialists that protection measures as well the measures undertaken for localising the accident were not sufficient. Sometimes they were not effective at all.

The low efficiency of the protection measures was mainly due to the concealment of information about the scale of the accident. Absence of legislation regarding radiation protection of the population was another reason. The system of informing about the emergency situation at the NPP was not actualized and no recommandations on the necessary measures of radiation protection were given to public.

The regime of radiation control was put in force only 20 hours after the accident. The headquarters of civil defense of adjacent regions of Belarus and Russia were informed about the accident too late. Another complication arose from the fact that the Chernobyl NPP administration could not understand the dire necessity of timely radiation monitoring. This monitoring was carried out only 12 hours after the reactor had exploded. Some places in the plant had radiation levels up to 200 Rems per hour but because of inadequate monitoring these places were needlessly frequented resulting in a lot of unnecessary doses.

It was only two hours after the accident that, iodine prophylaxis of the plant shift personnel began. The iodine prophylaxis of the Pripyat resident began 10-12 hours after the explosion.

The absence of necessary coordination between the Ministries of Health of the USSR and of Ukraine caused ten days of delay in taking the decision about iodine prophylaxis for residents living in the 60-kilometers zone. As a result of such delays a lot of children received thyroid dozes higher than 500 rad.

In spite of significant material expenditure and participation of a great number of soldires the efficiency of decontamination was low. The positive results of such actions were achieved only on the nuclear power plants sites. In other areas the decontamination had no desired results and only caused the additional irradiation of liquidators. From 1990 the scale of decontamination had. decreased to minimum.

Clearly, these "liquidators" were brave and selfless. They were also, unfortunately, used by Soviet authorities to create an impression in the coming months and years that something had been successfully done to contain the accident.

In August 1986, when Academician Valery Legasov, head of the Soviet delegation to Vienna, was faced with the fact that release of radioactivity began to increase on April 30th and May 1st, and that mitigation efforts apparently had been unsuccessful in stemming these release, he reportedly exclaimed: *"The people would not understand. We have to be seen doing something !"* Later that year, Legasov told the Soviet Academy of Sciences: " I *did not lie at Vienna, but I did not tell the whole truth."* Legasov committed suicide by hanging himself at home on April 26, 1988, two years to the day after the accident.

"The people would not understand. We have to be Been doing something.!"

There seemed to be an overriding desire by the government to convince the people of the Soviet Union and of the world that things were under control, and that the heavily damaged reactor building was isolated and secure. As it was being constructed-and to this day the most visible and attention-drawing symbol of triumph over the accident, the sarcophagus, was consistently portrayed as a tremendous concrete-and-steel engineering achievement that tightly retained radioactive debris. Further, the government claimed there was a complete accounting of the initial inventory of fuel and fission products.

In May 1991, Richard Wilson, professor of physics at Harvard, spoke that first International Sakharov Conference on Peace, Progress, and Human Rights in Moscow. Based largely on extensive private conversations he had with Russian scientists, he summarised several ways in which the Soviet government had attempted to control or censor information about the consequences of the accident:

- On Legasov's instructions, about six pages concerning radioactive releases in Belarus were removed from official report just prior to the August 1986 IAEA meeting and were not discussed.
- Several pages detailing the large quantilies of radionuclidesdeposited 100 kilometers and more Northeast of Chernobyl in the Bryansk oblast of Russia were removed from the report following directives from the Soviet Central Committee.
- Dosimeters in the possession of physicians and private individuals who had worked in the mitigation efforts following the accident were locked up by the KGB.
- Publication of "unauthorised" measurements of radioactivity were forbidden-even as late as 1990.
- Physicians in Ukraine and Belarus were forbidden to mention radiation in their medical diagnoses.
- Appeals by private individuals in Belarus that children not be allowed to drink milk in the first weeks of May 1986 were stopped for fear such warnings might cause panic.
- Health records of the "liquidators" (soldiers and others who constructed the sarcophagus and did clean-up work in the zone) disappeared after their work was completed. (Since the collapse of the Soviet Union, these data have slowly begun to surface.).

The range of the Soviet deception regarding Chernobyl seems endless. Consider the sarcophagus, which one Soviet document called a "concrete cube." The amount of concrete *claimed* to have been used to construct the sarcophagus range from 300,000 to 410,000 cubic meters. However, if one simply takes the cube root of this range of values,, the dimension of a pure block of concrete with these volumes would be in. the range of 67 to 74 meters on a side, This is larger (and certainly taller)than the actual sarcophagus, which is mostly empty space.

According to the structural drawings of the sarcophagus, the amount of concrete actually used in constructing the sarcophagus was about 161,000 cubic meters, which is still a lot of concrete. But a great deal of it leaked through holes in the reactor building onto the grounds of the station, or was used to cover the ground to shield workers.

The net affect of the government's propagandists claims was to draw attention away from the affected people and the extensive contamination of the environment, including great tract of agricultural land, and focus it on the sarcophagus, which represented "victory" over the accident. The Soviet leaders themselves wanted more than anyone else to believe that most of the contamination was contained within the sarcophagus, and so the stage was set for the creation of a myth that would remain unquestioned for several years.

"They should have given a little thought to the problem before acting so haphazardly," is the restrained assessment outside experts often make of the Governmental Commission's methods. Rather than carefully thinking through mitigation efforts, the Governmental Commission's intention were dictated by the passion to remain in control. For example, one must question the wisdom of constructing an 8.4 Kilometre perimeter wall, which was sunk into the ground to a depth of 30 meters. The project, known as *Casa Grande* , was abandoned when only partially complete. It was supposed to surround the station and stop the spread of radionuclides to nearby bodies of water.

The project was abandoned because by the time the workers were ready to extend the wall through the "Red Forest" (so named because the trees turned reddish before dying), the army had not got around to decontaminating the area. One bureaucratic tie-up led to another and the project was eventually "forgotten."

Meanwhile, the partially constructed section of the underground wall between the station and the Pripyat River acts as a dam. The result: the level of the ground water had risen to within 4.5 meters of the surface by 1992, according to Aleksandr Borovoi, head of the Department of Radiation Research at the Kurchatov Research Institute in Moscow. That is, the ground water level, which seems to have reached equilibrium, is much closer to the contaminated now than in 1986.

Another line of defence that was as ineffective as *Casa Grande* was the valiant attempt by miners and engineers to construct a heat exchanger below the core by tunnelling beneath the foundation of Unit 4. The reasoning: In the event of a much-feared "China Syndrome," there would be one more barrier between the ground water and the molten core. The project was undertaken Well after the active phase of the accident, and when it became clear there was no danger of a melt-through, it was abandoned. Workers in the area now call it the "Moonshine Still," because of its complex array of cooling pipes.

How much fuel?

No one actually knew how much nuclear fuel was left inside Unit 4 after the accident, nor did anyone know its condition well enough to predict its future behaviour. Preliminary analyses of hot particles in Sweden and Germany indicated that approximately 3 to 6 percent of the *mass* of the core, or about 6.7 metric tones, had been released beyond the bounds of the station. Based on these early results, the Governmental Commission hastily decided that 96.5 percent of the initial 190.2 ton fuel load was still located within the core region. This official estimate became the ultimate arbiter, the criterion to support the notion that the fuel had been accounted for and was tightly held within the sarcophagus. It was the key bit of the data with which to convince the World that everything was under control.

The Soviet leaders themselves, it seems, wanted to believe this, even if based on questionable evidence. For example, one of my colleagues recalls an incident at the Kurchatov Institute in which measurements by the *Igla* System (a wand like probe suspended from a helicopter) were presented and interpreted. In analysing the *Igla* date, it was concluded that the largest amount of fuel was contained within the reactor core area. Following this, an internal document was prepared detailing the locations and quantities of fuel within the reactor building.

The document seems to have been used to provide information to the IAEA's Experts Meeting in August 1986. Unfortunately, not only there-was almost no fuel in the reactor core area (the core shaft is virtually empty), but a few years later, when researchers entered the area of the Central Hall to examine more closely the remains of the reactor, the *Igla* detector wand was found to be jutting partially out of the southern spent-fuel pool, approximately 12 meters from the reactor shaft, and it remains there to this day.

How much radioactivity was released into the environment? That is still a contentious question. In 1986, the Soviet estimated 50 million curies. In my study, I concluded that the release of volatile radionuclides at Chernobyl was actually two to three times the Soviet figures. That was in line with earlier Western suspicions regarding the releases, and the estimates arc compatible with early satellite imaging investigations.

In fact, a recent publication by the organisation for European Cooperation and Development presents the findings of Swedish investigator Lennart Devell, which suggest an even greater total release of about 200 million curies, if one adds the contribution of the volatile isotopes, iodine 133, caesium 136, and tellurium 129.

Sadly, these higher release estimates support conclusions drawn by medical experts in a recent study by the World Health Organisation, which directly links the marked increase of childhood thyroid cancers and other maladies occurring in Belarus and Ukraine to releases of radioiodine from the accident.

An invincible bureaucracy

Ten years after the accident, Chernobyl is plagued by bureaucratic inertia. It is not always clear who is in charge of what in the zone. Every organisation associated with Chernobyl or the zone attempts to aggrandise its role. Organisations with curious acronyms such as Derzh Kom Atom, MinChernobyl, MinEcoBezpeka, ISTCShelter, and NVO-Pripyat all claim at least some jurisdiction.

The station controls access to the sarcophagus, and it is not eager to permit scientists to conduct research if their findings might help tip the scale towards eventual closure of the station. It is no wonder that people in Ukraine often describe the zone and the work there as *bardak-a* Russian word that literally means "whorehouse," but colloquially implies complete confusion and disorder.

The conditions under which scientists work at Chernobyl can only be described as tragic. There is a core group of about 30 of them struggling with, an "invincible" bureaucracy that serves only to impede their work.

Today, a brief tour of the zone will show anyone that little work has been done to properly dispose of now-radioactive equipment used during construction of the sarcophagus. Located just to the west of Unit 4 is an entire field of contaminated, uncovered, and rusting machinery and supplies.

Moreover, approximately 25 kilometers Southwest of the station near the small village of Rasokha are two " machine graveyards" shopping-centre-sized areas full of fire trucks, military vehicles, and helicopters used in 1986 during construction of the sarcophagus and decontamination of the surroundings. All of these are contaminated and standing in the open, surrounded by a double barbed-wire fence-with holes. Astonishingly, workers in the zone, including some of the scientists and technicians, frequently cannibalise this radioactive equipment for spare parts.

The dollar curtain

One of the terrible ironies of Chernobyl is that the world's worst nuclear-power accident has been so thinly investigated. Only 30 or so dedicated scientists struggle to find enough gasoline to drive to the reactor where they risk heir lives to make their measurements.

Over the past decade, the lack of contact with Western colleagues for these scientists has also taken its toll. While the iron curtain is long gone, it has been replaced by a "dollar curtain." With the economies of the newly emerged republic struggling to fulfil basic needs, financial realities limit scientific exchanges.

Alexander Sich
Bulletin of Atomic Scientists

Lessons Not Learnt

What if an accident on the Chernobyl scale were to happen in India? What would be the response of the authorities? Would the experience of earlier disasters like Bhopal or Chernobyl help other victims?

In India, the answer in short is no. The nucleocrats have been so busy in denying that accident can happen at all, that they have not bothered very much with learning what Chernobyl could have taught them.

Worse than having no plan!

The first and foremost point that strikes one about Chernobyl is the absence of previous planning. If only the authorities'had known what to do in case of an emergency, one would not have witnessed the bungling described earlier. If only the firemen would have been trained earlier on the hazards associated with radiation, they would not have picked highly radioactive graphite with bare hands, would not have dawdled over a smoke in areas of intense radiation. If only more working dosimeters were available, authorities could have had much earlier warnings of the severity of the disaster. If only iodine tablets had been distributed previously in the health centres of the region, the children would not have taken in high amounts of radioactive iodine in their thyroids and would not have suffered high incidence of thyroid problems. If only more doctors were previously trained in recognising radiation symptoms they would not have had to learn everything on the fly. If only...

Till 1987, Indian nuclear power plants did not have emergency preparedness plans at all. Like the Soviet authorities, Indians too felt that an accident was so unlikely that there was no need to prepare for one. Also the argument went that planning for a possible accident would create panic amongst the populace who had been fed stories of the impossibility of an accident in a reactor. One fallout of Chernobyl was that emergency plans were prepared and periodic drills have been held. However, the plans have been made with such a singular lack of imagination, that they are worse than having no plan at all.

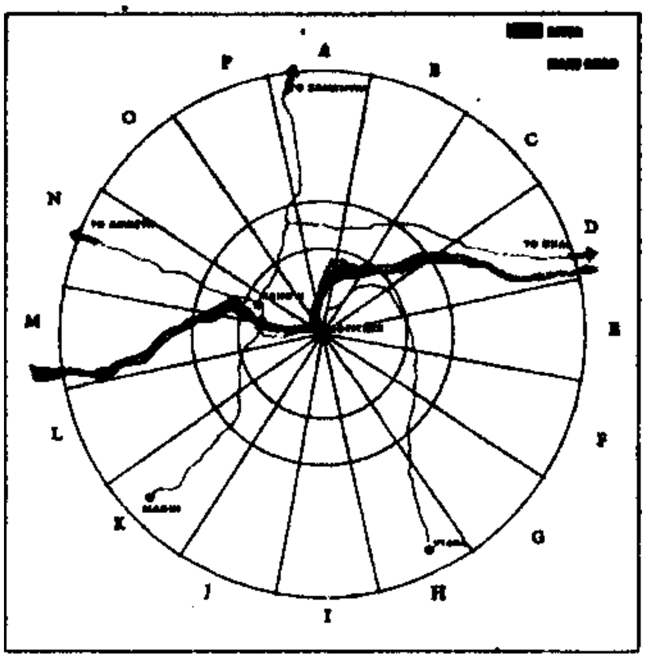
Getting contaminated in order to avoid contamination

In Chernobyl all the people living in 30 km radius had to be evacuated. The accident was not just one explosion on April 26. The reactor continued to spew radioactivity on and on for well over a fortnight before things came under relative control. During this fortnight, winds did not remain confined to just one direction, they changed course. So, at different times, different regions of the country were affected. Also, depending upon the rainfall patterns, pocket's hundreds of kilometres away from Chernobyl were severely contaminated. Absence of measuring equipment and trained personnel meant that a number of such regions were not detected quickly. The authorities in fact transferred some of the evacuated population from near Chernobyl to such areas and then found that these areas were themselves as badly affected as regions near Chernobyl, and thus there had to be a second evacuation.

Let us consider the Kakrapar evacuation plan in the light of this experience. The plan confines itself to just 16 kilometres radius since doing anything more would mean evacuation of such large numbers that even our can-do everything authorities feel it to be beyond their capacities. The whole area has been divided into 16 sectors, numbered from A to P in a clockwise direction and the plan is that if the wind direction is towards sector A, then the population from there would be moved to schools in villages beyond 16 kilometres in section D (See figure). In case the wind direction is towards sector B, the plan calls for the evacuation of the population in that sector towards sector E, and so on clockwise for all sectors. This plan is totally oblivious of the geography of the area. The river Tapti runs from East to West, and the only bridge is near Mandvi about 5 km from the plant. Thus in this plan, if you happen to live anywhere in sectors B, C, D or in sections J, K or L, then you would have to cross the river by going to Mandvi. Thus, in case the wind is in. any of these directions, people will first have to travel opposite to the wind direction to get to the bridge getting themselves contaminated in the process in order to escape the contamination in the first place. Of course India being the land of Vayu and Maruti, we can order the winds to continue flowing in one direction only while the evacuation takes place.

This is just one of the many obvious follies of the plan. It envisages keeping whole towns like Vyara (population 40,000) in a high school which can't even accommodate 5000 people packed like sardines. Or a town like Mandvi (population 15,000) and two other villages are to be accommodated in the primary school of a small town of Mangrol whose total population is less than 7,000. Such absurdities are of course, no concern to people asked to devise an emergency plan to satisfy international pressures. Things like the total absence of toilet facilities etc. are way beyond their ken during emergencies. A surefire recipe for epidemics to follow the accident.

Most of our reactors are fairly close to state boundaries. This is a general feature of reactors world-wide. Beneficiaries are generous in sharing risks with non-beneficiaries. However, the emergency plans are state civil authorities concern and thus Gujarat has no emergency plan for Tarapur whereas Maharashtra has none for Kakrapar though both the reactors are close to the state boundary.



Kakrapar Nuclear Power Plant and Surroundings

Anything connected with nuclear is a state secret

The absence of previous planning is only one of the points raised by Chernobyl. The other major point is the obsession with secrecy which denied people information about the status of the disaster and their own health for years on end. It is this feature of Soviet style which Indian officialdom has embraced with gusto. Thus although emergency preparedness plans have been prepared for whatever they are worth, they are not available to the general public even after repeated requests. The nuclear authorities will refer you to the civil authorities and the civil authorities will in a civilised manner inform you that only nuclear authorities are authorised to divulge the plan. It is another matter all together that people living near such hazardous facilities have no scruples in obtaining such information clandestinely.

Surendra Gadekar

Nucleocrots *of the World, Unite!*

The International Atomic Energy Agency (IAEA) still clings to the myth-first promulgated by the Soviets-that 5,020 metric tons of sand, clay, dolomite, boron carbide, and lead dumped from the helicopters in the first few days after the Chernobyl accident found their mark and succeeded in smothering the "burning" Unit 4 core.

But it is now clear that the helicopter pilots did not cover the core. Rather with pinpoint bombing accuracy performed under extremely hazardous conditions, these brave pilots managed to smother the infamous "red glow," which was thought to be the burning core. Unfortunately, the red glow is now widely assumed to have been only a minor portion of the core, thrown up and away from the reactor in the devastating steam explosion. The location of the red glow was 12 to 15 meters from the reactor core shaft, on the floor of the Central Hall, which was left roofless by the explosion.

About 71 percent of the fuel in the core (roughly 135 metric tons) remained uncovered in the reactor shaft after the explosion. Eventually the fuel melted through the reactor's lower lid and flowed into the lower regions of the reactor building, where it cooled and hardened into lava-like substance. About 25 percent of the core was scattered in and around the remains of the reactor building, and almost 4 percent dissipated into the environment-producing radiation contamination that was detectable over the entire northern hemisphere.

The bottom line: most of the core remained in the Unit 4 building, as the Soviet later said. But instead of being smothered, the core remained exposed to the environment, releasing radioactivity into the atmosphere for nearly 10 days, at which point the remnants cooled down on their own.

IAEA: Hand in Glove with the Soviets

Even today, the IAEA's official position, first expressed in INSAG-1 the International Nuclear Safety Advisory Group's review of the Soviet Report presented in Vienna in August 1986—support the Soviet version of events. It concludes that "accident management actions taken at Chernobyl were, generally, quite successful." Dumping the materials into the reactor shaft, the review added, "stabilised the situation at an early stage."

The IAEA's defence of this position, based preliminary on information provided by Soviet government, seems particularly awkward today, because data and analysis indicating that the core had not been smothered became available in the West at early as 1989. Even more embarrassing, is that the IAEA itself sponsored a 1990 report by Aleksander Borovoi, one of the key scientist investigating the Chernobyl accident. His data clearly indicated that the Core was not covered by the materials, and that approximately three times more caesium 137 was released into the atmosphere than the Soviet had admitted. The IAEA apparently ignored Borovoi's work.

My research at Chernobyl, which partially drew on the courageous work of Borovoi's and his Russian and Ukrainian colleagues, eventually led to a broad reappraisal of the accident and its consequences. The main intent was to recreate the sequence of events during the nine days following the explosion, when the destroyed reactor was actively releasing radionuclides into the environment.

After my findings became known in early 1994, Morris Rosen, deputy director of the IAEA, noted that he had flown over the reactor in May 1986, and he could vouch for the fact that "the material certainly got into the core region." My work, an IAEA spokesperson told a newspaper reporter in 1994, was "flawed and not worthy of serious attention."

Indeed, it is aerial observations of the destroyed reactor that were more likely to be flawed. For one thing, the 2,000-metric tons Upper Biological Shield-the reactor's "lid"-was perched, at cockeyed angle, above the reactor well, blocking the view into the reactor core.

Need to be Sceptical of Official Russian Data

During the general discussion, the chairman Dr. Shigematsu, stated that there were no cases of paediatric cancers of the thyroid in Russia. The Russian physician who presented 67 cases of thyroid cancers in children, recently operated in a centre close to Bryansk, stated the contrary. The chairman indicated he had been informed that there was no epidemic of thyroid cancer in Russia, during a medical conference on the same subject in Japan, less than two months earlier. The explanation for this misunderstanding, was the fact that, within a few months, the official attitude has changed: in Russia, facts regarding thyroid cancer may now be published.

Meanwhile, over the years, the scientists who have actually entered Unit 4, at great personal risk, have taken about 200 bore samples and have made enough visual and robotics observations to conclusively prove that virtually none of the material from the helicopters entered the core shaft. If it had, significant amounts of it would have been found in the lava like remnants of the core. In fact, only traces were found.

In retrospect, the IAEA's approach to Chernobyl should surprise no one. After all, the IAEA is in the business of promoting nuclear energy, not discouraging it. For ten years, the agency has attempted. to downplay the consequences of the accident. In 1987, for example, well before information began to filter out the Soviet Union on the true extent of the accident, an IAEA report reassuringly said, "If anything, there will be a modification downward of early calculations of risks and predictions of health consequences."

And, too, the IAEA has been markedly unaggresive in questioning official Soviet and Russian Chernobyl data and analyses because the Soviet Union (and now, Russia) plays a significant role in the governance of the IAEA.

For several years after the accident, the IAEA seemingly ignored specialists from republics other than Russia, which dominated the Soviet central government. But Russian data were controlled and often suspect: Russia had 11 Chernobyl-type reactors essential to power production, and thus it had clear political need to minimize the consequences of the accident.

Dealing almost exclusively with the Russians, however, not only restricted IAEA access to information, it alienated the IAEA from the people of Ukraine and Belarus, the republics most affected by the accident. The IAEA didn't help matters by derisively labelling as "radiophones" those who were genuinely attempting to draw attention to the accident's health effects.

To battle over the body count misses the point: Is not one victim enough to condemn a reactor design long known to be deficient? However, the IAEA attitude has been characterised by Deputy Director Rosen's careless statement at Vienna conference in August 1986:

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"Chernobyl shows us that even in a catastrophic accident, we are not talking about unreasonable numbers of deaths."

Alexander Sich
Bulletin of Atomic Scientists

Verdict on Health: Plenty to Worry About

As recently the summer of 1994, the British Medical Journal was headlining its editorial on Chernobyl "Probably nothing to worry about".

Unfortunately there's plenty to worry about: Scientists were expecting that the first disease to appear would be leukaemia since that is what had been observed amongst the Hiroshima and Nagasaki survivors. Everyone is now agreed that, although childhood leukaemia have not shown that sharp an increase, there is a dramatic and increasing incidence of thyroid cancer in the most contaminated areas.

Several scientific meetings were organised in connection with the 10th anniversary of the Chernobyl disaster. The World Health Organisation (WHO) planned the first of this series from November 20 to 23, 1995 in Geneva. At this conference, results of the "International Programme on the Health Effects of the Chernobyl accident (IPHECA) pilot projects, and related national programmes, were presented.

Who are the affected?

Those affected fall mainly in two categories. One are the liquidators- the men and the women called in to clean up immediately after the accident. They should be the first to feel the effects from Chernobyl. Studies reported to the WHO from Ukraine and Belarus are beginning to suggest that cancer is increasing among them, but the results are far from conclusive. No one even agrees how many liquidators there are. The WHO figures of 800,000 was briskly dismissed as grossly exaggerated by Leonid Ilyin from the Russian Federation Ministry of Public Health. Ilyin says the real number was closer to 200,000.

One of the reasons why such a large force was conscripted to decontaminate the reactor surroundings was that the neighbouring units I, II, and III could continue to produce electricity since Chernobyl was one of the largest electricity generating station in the Soviet Union. Liquidators are under permanent stress, especially as nobody is in a position to indicate the actual consequences for their health because of their engagement.

The other group are the more than 2 million inhabitants of the region around Chernobyl, living in contaminated parts of the three CIS-countries, Belarus, Russia, and Ukraine. Their situation differs from that of the liquidators. The intensity of irradiation may have been less than for liquidators, but the duration of exposure to radiation is much more prolonged, already a decade. The assessment on the actual risk for the population has to be studied by the medical community. Much less is known for such a chronic situation, compared with the risk following an irradiation limited in time. Chernobyl could give an opportunity to learn precisely the clinical risks associated with low dose radiation. The consequences of such studies will allow to take preventive measures in the future.

> *The epidemic of thyroid cancers is likely to continue for decades and involve many thousands of children. As many as 40% of the children exposed to the highest levels of fallout from Chernobyl when they were under a year old could go on to develop cancer as adults.*

The Scale of the Problem

Dr. Valery S. Sorokine, from Russia, said that there were 80 million persons irradiated in the country. This figure includes persons living in areas of Russia where earlier accidents and routine dumping have occurred. Besides Chernobyl, there is the Altat, Chelyabinsk, Oural, Kazakstan, Kola, and many other territories contaminated by nuclear wastes, accidents or atomic explosions. In this country, control groups must be selected in clean zones, which may be difficult, as 17 million hectares are contaminated.

For Dr. Y. Korolenko, Minister of Health of Ukraine, 30 million inhabitants drink water contaminated with radionuclides. He indicated that 600.000 square Km. had to be abandoned, this includes fertile soils, and 40% of the forests of the country. Today more than one million persons are living in contaminated areas, with more than 5 Curie/square metre.

For the Vice-Minister of Health of Belarus, Dr. N A Krysentko, 23% of the national territory is contaminated, 2 million persons-including 410.000 children- have been or still are irradiated.

Millions of refugees exist worldwide. However, when evacuated from a radio-contaminated area, refugees cannot consider returning home for their life-time or a very long period. The absence of such hope affects hundreds of thousands; this has detrimental psychological consequences. Furthermore, the 200.000 refugees are aware that they have already been irradiated before leaving their homes, i.e. they are at higher risk than others of suffering from cancer or giving birth to deformed children. Unfortunately, nobody informs them accurately about the risks.

Thyroid Cancers in Children

Before the accident in the regions surrounding Chernobyl the annual incidence in the children under fifteen years was 0.5 per million children (a similar incidence as in the UK). 680 cases of thyroid cancer have now been confirmed in Belarus, Ukraine and Russia since the accident; the cases are concentrated in an area where rain deposited the heaviest iodine contamination, more than 200 kilometers north of Chernobyl. The incidence in the Gomel region of Belarus is more than 100 per million. The epidemic is likely to continue for decades and involve many thousands of children. According to Dillwyn Williams of Cambridge University, as many as 40% of the children exposed to the highest levels of fallout from Chernobyl when they were under a year old could go on to develop cancer as adults.

Iodine deficiency

The exact cause of the increase in thyroid cancer is still not clear. The incidents in children born more than 6 months after the accident seems to be much lower, suggesting that early inhalation and ingestion of radioactive iodine were responsible. It is not clear at present whether iodine-131 is solely responsible, or whether other short-lived isotopes (iodine-130,132, 133 and 135) are implicated too; the amount of iodine-133 released was almost a third of that of iodine-131. Uptake of radio-iodine was further increased because regions surrounding Chernobyl are deficient in iodine, and iodine deficiency disorders (e.g., goitre) are common; and for the same radio-iodine intake, an infant would receive about ten times the absorbed thyroid dose as would an adult.

The surgery of such cancers is devastating, with the risk of harming the parathyroid glands. As a consequence, treatment of children with thyroidectomy is very difficult, and costly. This represents a dramatic health problem for countries in severe economical crises. If there exists a concomitant deficiency of parathyroid hormone, the therapeutic measures to be taken become even more problematic.

The atomic industry promoters, claim that thyroid cancer is the only neoplasm associated with the accident, and furthermore that this kind of cancer is usually not lethal, because it is easy to treat. This is contrary to the truth and cynical. Treating malignant and endocrine diseases in small children is much more difficult than treating the same condition in adults.

Some scientists assumed that the increase in thyroid cancer was just due to 'ascertainment bias' (i.e., the harder researchers look for an effect, the more likely they are to find it). There has been a reluctance on the part of some scientists, particularly in the US, to accept that iodine-131 is the cause, partly because there is no clear evidence of iodine-131 having caused thyroid cancer when used therapeutically, as it often is, to treat overactive thyroid. However, there may be a big difference between giving large doses of iodine-131 to an adult, diseased thyroid - with the object of killing as many of its cells as possible -and low doses to the normal thyroid of an infant or child, where the potential for mutagenic effects could be far greater. More worrying, it has been suggested that government scientists in the US may want to play down the effects of the release of iodine-131 because of the large quantities released from the Hanford nuclear site in the 1940s.

'Good' Cancer Propagandists

The atomic industry promoters, claim that thyroid cancer is a 'good' cancer since it is usually not lethal, and it is easy to treat with replacement therapy. Unfortunately, it is difficult to treat afflicted children anywhere, especially so in countries where the accident and social disruption, has meant a severe shortage of funds for medicines and medical services

One reason that seems to make ascertainment bias unlikely is the aggressive nature of the disease; affected children quickly become unmistakably ill with secondary cancers in the lymph nodes of the neck and lungs. Treatment can be high doses of iodine-131, but obviously administering yet more radioactivity is difficult. The alternative is surgery, but there is a problem here too: it is usual in thyroid cancer to remove the whole thyroid, but the scarcity of thyroid replacement hormone has made some surgeons reluctant to do total thyroidectomies; instead they remove only part of the thyroid, which may miss some of the cancer cells.

Whatever the exact mechanism responsible for the increase in the thyroid cancer, at least one thing seems clear: the recommendations and arrangements for iodine prophylactics in future accidents have to be looked at very carefully. For the thyroid, the National Radiological Protection Board specifics a low 'emergency reference level of 30mSv - if the predicted dose to the thyroid is likely to exceed this, administration of prophylactic iodine may be justified. If the predicted dose is above 300mSv, prophylactics is deemed essential. As a result of the Chernobyl experience it has been argued that the lower limit should be reduced to 10mSv, at least in children.

What further cancers can be expected in those most exposed? The World Health Organisation (WHO) points out that the tissue most sensitive to radiation exposure, in addition to the thyroid and bone marrow, is the breast of the young women; populations within 100km would be particularly at risk, and we may expect a rise in the incidence of breast cancer. Effects of airborne radioactive particles on the induction of skin and lung cancers is also a matter for concern. And the 'liquidators' - about half a million people, mostly young men, who cleaned up.after the accident - are reported to have an increased incidence of cardiovascular disease, not normally associated with radiation exposure.

Other Non-Cancerous Effects

Several researchers from the former Soviet Union argue that radiation from Chernobyl is also causing increases in a range of non-cancerous diseases. Alexei Okeanov from the public health research centre in Belarus, for example, says the Chernobyl accident is responsible for an unqualified increase in the rate of cataracts, cardiovascular disease and hyperactive thyroid glands. The link between radiation and cataracts has been well established by studies of Japanese A-bomb survivors. But Western researchers have been sceptical of links with other non-cancerous conditions because they do hot have a well understood causal link.

However, a new study of the A-bomb survivors presented in Geneva provides the first serious evidence that radiation may help to trigger strokes, heart disease and cirrhosis of the liver. Direct correlation between radiation exposure and all three conditions are highlighted by researchers from the joint US-Japanese Radiation Effects Research Foundation in Hiroshima. They also reveal evidence that hyperactive thyroids and non-malignant tumours in the uterus, ovary, stomach and thyroid.

"We are now almost sure that non-cancerous diseases have increased among atom bomb survivors," says the head of the foundation, Kazunori Kodama. "But we need extensive studies to discover "why." One possible clue is that cholesterol level in the blood, which is a risk factor for strokes and heart disease, are higher than average among A-bomb survivors.

Increasing Mental Retardation

More disturbingly, evidence is emerging that radiation may have damaged the developing brains of foetuses in the womb. The WHO is sponsoring a study to compare the cognitive abilities of 2189 children born in contaminated areas. Preliminary findings suggest that children from the contaminated areas are suffering more mental retardation, more behavioural disorders and more emotional problems.

According to one the project's researchers, Irina Kozlova from the Russian Academy of Medical Sciences, half the children irradiated in the womb have experienced "some kind of mental disorder". A higher than average proportion of them, she says, have an IQ lower than 70, which suggests they are likely to be mentally retarded. Precise figures will not be known until the research is completed. Kozlova thinks that even very low levels of radiation could damage neurons in the brain of a foetus.

"We cannot rule out the effects of radiation on the developing brain," agrees another researcher from the WHO study, Anagelina Nyagu from the Ukrainian Academy of Medical Sciences. "The problem of prenatally irradiated children is unfortunately going to be priority." These findings reinforce those from Hiroshima, where 1100 children exposed to radiation in the womb also suffered a higher than average rate of mental retardation.

Thousands of adults have also experienced psychological problems in wake of Chernobyl, but not because their brains have been harmed by radiation. Uncertainties about radiation risks, coupled with the social dislocation provoked by large-scale evacuation programmes, cause anxiety and stress. Real or imagined health worries, loss of homes, changes in jobs and financial difficulties precipitate depression.

Terence Lee, professor of psychology at St. Andrews University, says that people around Chernobyl feel powerless and fatalistic, a condition he calls "chronic environmental stress disorder". The solution is to give them reliable information about the risks of radiation from sources they trust, he says.

"The atomic Mafia seem to believe that the problem can be solved by slides showing multicoloured entrails of nuclear reactors, but this is of course to no avail."

Birth Defects

Very few studies have been done on this subject. Prof. G. Laziuk has described genetic anomalies in new-born: amelia and polydactylia increased. This increase is not directly proportional to the dose received. To reduce the number of malformations, pregnancy interruptions became more frequent: from 12.5 to 17.4/1000 between 85 and 94.

It has been published that malformation in pigs and calves have increased by factors 100. In some places, it is no more possible to breed pork, as there are too many malformed offspring.

Research Effort in Absolute Chaos

Distinguishing between disease caused by radiation and disorders provoked by stress is just one of the problems faced by researchers. Obtaining a clear picture of the health effects of the accident has been hampered by the disintegration of the Soviet Union and clash between Eastern and Western European scientific cultures. According to one senior researcher, the entire international research effort "is in absolute chaos".

Insiders say that, instead of collaborating, research institutes in Belarus, Ukraine, Russia, Europe, Japan and

America are competing for the same limited set of health data. Some researchers allege that political differences, national chauvinism and the egos of individual academics are preventing serious co-operative science. International collaboration, admits Baverstock from WHO, is "disgracefully poor." As a result research is fragmented and its conclusions often disputed. Baverstock points out there is no real, mechanism for exchanging information. He is pessimistic about whether collaboration will ever improve. The credibility of the international scientific community is at stake, he says.

Dr David Sumner
Chernobyl: Ten years on,
Safe Energy Journal

Preparing for the Next Chernobyl

For most people in the world, one Chernobyl is enough. But there is a lobby which is so addicted to nuclear power and believes that it is such a wonderful source of energy that it cannot under any circumstances think of abandoning this madness. When questioned as to the number of fatalities the accident had caused and the impact of the accident on Soviet society and Soviet nuclear industry, A.M. Petrosyants (then chairman of So-viet State Committee on the Utilisation of Atomic Energy) responded: "Science requires victims." M. Hans Blix, (the long time chairman of the International Atomic Energy Agency (IAEA) and a well travelled spokesman for this lobby)declared in 1986 that "due to the importance of this source of energy, the world could support one accident of the Chernobyl scale every year...."

It is against this background of cockeyed conviction that one must examine the bizarre contributions of the nuclear lobby. The International Atomic Energy Agency (IAEA), the UN body responsible for promoting and policing nuclear power, argued that government decisions to evacuate more than 135000 people and to impose widespread restriction on farming and food consumption harmed the lives of "hundreds of thousands, if not millions of people".

Belarus Authorities Let People Return to Chernobyl Territories

Authorities of the Belarus Republic have launched a campaign to return people to regions which have suffered from the 1986 accident. The campaign was begun after Belarus President Alexander Lukashenko declared upon visiting the Chernobyl territories that people should return to abandoned lands. Soon thereafter, the president's Academy of Administrative Management developed an unusual document entitled "Programme for improving public information on problems of Chernobyl and radiation safety."

The document states that public consciousness exaggerates the consequences of Chernobyl accident. One item of the action plan calls for directing public attention to positive factors by propagating positive information.

The program also foresees a campaign to influence top officials in the media and to influence the public through the media. The authors specify the use of works such as "Psychological warfare" and "Manipulation of consciousness." State newspapers are already working according to this programme.

The new Chernobyl policy is based on conclusions of government scientists that over the past 10 years, Chernobyl—contaminated territories have been substantially cleared of risk due to natural radioactive disintegration. This conclusion was also the basis for the government's decision to rehabilitate the abandoned lands. According to data from the Emergency Ministry, 6,000 hectares of contaminated territories are already in use.

The director of the Institute for Radiation Safety, Academician Vasiliy Nesterenko, believes Lukashenko has made a serious error. Nesterenko points out that the official physicists have based their reasoning about radioactive disintegration only on strontium and cesium, ignoring other radioelements. He believes development of the contaminated territories is premature at this time. Nesterenko notes that about 70% of the radioactive particles emitted by Chernobyl-4 fell on Belarussian territories.

Nevertheless, the resettlement campaign is going forward, primarily because of the country's economic crisis, unemployment, and shortage of arable land. People are coming back to the Chernobyl zone, where there is work for them. Last year, crops were harvested on developed lands. This year, it is planned to expand the arable land by a few thousands hectares.

Peter Coryn, Chernigov, Ukraine
Nucleonics Week

The IAEA claims that radiation exposure will result in a marginal and probably "undetectable" increase in cancer. Cases of thyroid cancer will amount to "a few tens in a million per annum". Last year, the number of children in Gomel who contracted the disease reached 240 per million.

Filthy Lucre Ahead by a Mile

The objective follow-up of populations after the Chernobyl catastrophe, should have given the world an opportunity to improve our knowledge about the risks at low doses. Studies performed during the last decades, have shown that earlier dose limits were always set too high, and that lower limits would be safer. But in this competition between sound health of large populations verses the bulging pocketbooks of some, il is the greedy who art winning. "Experts" have already decided to increase limits of accepted contamination of water and food, before data becomes available from conclusive studies.

Politicians and experts supporting atomic energy, including those of IAEA, and experts from France, intend to change the official limits for radioprotection. These experts wish to change rules so as to reduce the immediate cost of future accidents. For the promoters, the limits assigned after Chernobyl accident have to change, in the sense that much higher radiological contamination should become legally acceptable.

Furthermore, the contamination labelling needs to become so complex that grocers or border guards will not be in a position to decide by themselves if milk, meat, or vegetables are safe or not to be given to children or adults. Instead of "Becquerels per kg." of food they now want to subdivide this into Becquerels for each individual radionuclide: Caesium, strontium, etc. This require new apparatus. Globally, however, the aim is that contaminated food be considered less dangerous than it is today. Again, the aim of such changes is to reduce the responsibility of nuclear industry, and reduce the cost of preventive measures for the "next Chernobyl."

Dr. Michael Fernex

The Tricks of *the*

The general aim of epidemiological trials is to find out if an event has health consequences. However, if experts begin with a motive of not wanting to demonstrate consequences, inadequate studies can be undertaken which will 'prove' that effects do not exist. Such studies usually suffer from the following sources of error:

- Selection of wrong health indicators: e.g. mortality instead of morbidity.
- Screening for the wrong pathology: e.g. ignoring leukaemia, digestive, lung, mammary carcinoma.
- using the wrongtiming: e.g. ignoring long incubation period, then declaring "10 years after Chernobyl, nothing more can be expected. We know how to manage the next accident."
- selecting the wrong target group: e.g. not studying the most susceptible group or not selecting the group with the highest exposure.

Having thus selected either wrong methods or wrong targets or both :

- the results will show no statistically significant difference with any control group.
- the conclusion will be that the hypothesis was wrong.
- the consequence will be that the authorities will be convinced that everything is under control and business as usual can proceed.

Revittimtsatlon:
A sorry tale with no *ending*
Three Mile Island, Bhopal and Chernobrl...

"There is no free lunch. Somebody has to pay the price of development." How often have we heard this from those who pay no price at all for anything. But that is a different tale. To the victims, development is not a good whose price is paid once but an unending nightmare which demands an undefined, unbounded payment which continues on and on.

Take the Three Mile Island accident for example. On 31st March 1979, a stuck valve started a series of events which culminated in a partial meltdown of the nuclear reactor. Fortuitously, the accident did not result in a huge explosion with a large release of radioactivity to the environment, but nevertheless there was radioactivity release to the environment in excess of prescribed 'limits'. People living near the reactor did suffer harm. Infant mortality and spontaneous abortions, congenital deformities in both humans and animals in the region rose in a significant manner. But to the nuclear authorities, these were of "no concern to the community." More than 2,000 victims of this disaster have filed court cases against the owners and operators of the plant, but they got their chance to tell the Court about their injuries and sicknesses only in June 1996, that is fully 17 years after the disaster. On 27th February, 1996, the United States Supreme Court turned down the argument of the nuclear industry, put forth by the owners of the reactor with the support of their nuclear "experts" in the industry, that even though the radiation exposure of the people was above federal limits no one was actually exposed to "excessive* radiation and therefore no one experienced radiation detriment. Most of these court cases involve leukaemia, or other cancers, and most of the victims are destitute; the inevitable result of having lost employment and health insurance. Nevertheless, the nuclear industry has relentlessly pursued the loop hole which it saw in an earlier Supreme Court's ruling: that for expert testimony to be admissible in the court, its scientific basis had to be generally accepted in the relevant scientific community. Using this criterion, the nuclear industry challenged all the expert witnesses which the victims had found willing to assist them in their suit against the nuclear management which had caused the disaster. In pre-trial hearings, the nuclear industry managed to have the court eliminate almost all of the victim's expert witnesses. The nuclear 'experts' who work for this industry were considered by the court to be the "relevant scientific community", and only the documents produced by nuclear promoters such as the International Atomic Energy Agency (IAEA) as "authoritative".

It is good to remind ourselves that all this has happened in the United States- a country which prides itself as the home of "freedom and democracy". After this it should come as no surprise to victims of Bhopal, that their sufferings are not heard and the few crumbs thrown as "compensation" are all that they are going to get from relying on the conscience of the corporate tycoons and their Indian collaborators. In Bhopal the bodies of the victims lined the streets and the disaster was apparent to everyone, but in a radiation accident like Chernobyl where death stalks slowly over the years, revictimisation means that victims are not recognised as victims at all. Thus, while the Ukrainian health ministry says that 125,000 people died due to the accident, IAEA still sticks the ridiculous figure of 28 deaths.

> *By use of very restrictive definitions, most of the illnesses and health problems which are actually experienced by the victims of a disaster like Chernobyl are not counted*

This jugglery is done through restrictive definitions of dose and risk. Thus, distinction is made between dose due to the "accident" and doses due to clean-up. For example, the dose may be defined as only that received in the first seven days, and even that amount will be reduced by the dose expected to have been received in the course of normal operation of the reactor. Death due to radiation exposure requires a dose estimate for • the victim above the threshold and death must occur between the exposure and 30 days thereafter.

Similarly, radiation detriment to health is divided into two categories:

Deterministic effects of radiation: This category of damage is considered to be evidenced by radiation burns and acute radiation sickness, such as was experienced by the firemen at Chernobyl. Detriment is based on the overall effect to the group, not the individual. Any effect not felt by everyone in the group, is classified as reversible, transient and of no concern to the group and hence not included in the detriment.

Stochastic Effects of Radiation: these include those effects which occur with statistical regularity in the exposed population such as cancer and genetic effects. These have no threshold. In order to ensure that these are radiation induced, nucleocrats recommend not counting any which have not had a "normal" latency period which is ten years for most cancers, and are not severe genetic effects in live-born offspring. Radiation promoted cancers are not recognised as radiation related. Genetically damaged offspring who die in ulero are said to be of no concern to the community since they do not cost the community financially.

By use of these very restrictive definitions, most of the illnesses and health problems which are actually experienced by the victims of a disaster like Chernobyl are not counted or do not exist for the nuclear promoters. Automatically excluded are: direct damage to tissue which results in altered biological function, like changed blood parameters, hormone or enzyme production, etc. Most evident in exposed children; embryonic and foetal death; genetic diseases not deemed "serious" like asthma, teratogenic damage including mental retardation, epilepsy, bone deformities, blindness and deafness, radiation promoted cancers which are clinically diagnosable in less than ten years after the disaster and autoimmune diseases.

With such preparation, is it any surprise, that the IAEA meeting on "Ten Years of Chernobyl" found that the disaster had had no consequence at all and recommended that governments of the region move people back to contaminated land?

Surendra Gadekar

Fighting for the straps

When International Atomic Energy Agency (IAEA)inspectors visited Bulgaria's Kozloduy station in 1991, they encountered missing stairway steps and gaps in walkway gratings. One inspector fell through a hole, bruising his leg. Railings around pools were missing, as were light bulbs and fixtures. Windows were broken, pumps leaked steam, and pools of oil and water were everywhere.

Western nuclear vendors could easily imagine that a serious nuclear accident in Central Europe or the Balkans would spread fallout over the major population centres of Europe, and they decided something should be done. At a June 1992 summit, the G7 industrial nations organised emergency measures to reduce near-term safety risks and to assess the feasibility of closing down the most dangerous Soviet-style RBMK-1000 and other VVER-440 reactors. The loss in generating capacity would be balanced by improved energy-use efficiency and alternate energy sources. Western nations, the European Union, the IAEA, the Organisation for European Cooperation and Development, and the European Bank for Reconstruction and Development (EBRD) pledged more than $785 million to improve safety RBMK-1000 and VVER-400 and -230 units. But five years later the only reactors to have been shut down are those inherited by the newly reunified Germany. Elsewhere in Eastern Europe, closure of the most dangerous and accident-prose reactors has been delayed indefinitely, although safety has improved at some plants.

I *Wanna Hold Tour Hand*

Western nuclear suppliers got a new lease on life with orders for everything from training support to new instrumentation and control centres and waste-storage buildings.

Ironically, Western-funded short-term safety improvements have encouraged the continued operation of the most dangerous reactors-at places like Kozloduy, Slovakia's Bohunice, Chernobyl , and Russia's Kola. Meanwhile, Western contractors like Westinghouse and Siemens have forged links with Eastern Europe's state-run utilities, most of which operate as subsidiaries of state energy ministries.

In 1993, Westinghouse invited four high Ukrainian energy officials to tour US reactors and discuss the possibility for joint completion of unfinished Ukrainian plants. ."We are children in the world economy, but we know what needs to be done," the head of Ukraine's parliamentary committee on science and technology, Pavel Kislyi, told *Energy Daily*. "We need a company like Westinghouse to hold our hand."

Nuclear colonialism?

Now most countries in the region are planning to extend their nuclear generating capacity, either by purchasing new Western-designed plants or by completing reactors left unfinished under communism. Last January, Atomic Energy of Ganada completed the first of the five reactors that were planned at Cernavoda. Westinghouse is working with the Czech utility CEZ to complete two Soviet-designed VVER-1000 reactors at Temelin, near the Austrian border. Electricite du France and German utility, Bayernwerk, had planned to complete Slovakia's unfinished Mochovce plant, which is equipped with second generation VVER-440s. Ukraine has conditioned the closure of Chernobyl on a wide-ranging package of Western aid designed to help Ukraine update its power systems, and finish three VVER-1000s. Hungary, Bulgaria, Poland, and Lithuania are all considering expanding their nuclear capacity, and Russia has announced a plan to double nuclear power generation by the year 2010.

Western governments are supporting these plans by providing loan guarantees. The US Export-Import Bank has committed $317 million for Westinghouse's work at Temelin; Canada loaned $270 million for the Cernavoda project; and, at one time, the EBRD had promised DM 700 million to Mochovce. By 1993, Friends of the Earth, an environmental group, reported that Western governments and institutions had committed twice as much money to completing unfinished Soviet-style reactors as they had to improving safety at operating reactors.

Because so many Eastern countries lack the financial resources to pay for their new nuclear capacities, building loans may be paid off by exporting some or all of the electrical output. For instance, Hungary has invited bids for 2000 megawatts of new capacity-twice its projected need. A West European partner could receive deliveries of electricity without the risks of operating, fuelling, or decommissioning the generating plants. Such a plan would also allow a West European government to dodge the public opposition to nuclear power that has suffocated most Western programs.

Meanwhile, the Eastern partner would be responsible for operational and incidental costs, including the costs of fuel and waste disposal, new transmission lines, and hundreds of power plant employees. At the end of the plant's lifetime, the Eastern partner would have to bear the costs of decommissioning, which alone can add at least 3Q percent to the initial cost. Not just construction, but many of the "downstream" activities would require the services of Western consultants and suppliers.

"It's one of the last markets in the world for the Western nuclear industry," says Paxus Calta, an anti-nuclear campaigner for the Vienna-based environmental group Global 2000, who believe that Western and Eastern nuclear interests have formed an unholy alliance.

"The Eastern nuclear establishment is very interested in maintaining their monopoly power, avoiding privatisation, stopping market reforms, maximising profits, and maintaining the options for kickbacks and corruption."

Communist party planners turned to nuclear power as the basis of their long-term energy strategy in the mid-1970s, when the price of Soviet oil and gas increased. Bulgaria was to have more than a dozen reactors by 2005; Czechoslovakia, 30; Poland more than 20; and Hungary and Romania, half a dozen each.

Some of these projects were never started, but of the others, many plants were left unfinished. Millions-sometimes billions of dollars have been invested in them. The engineering and professional organisations that would have built, operated, and supplied the reactors-big firms like Skoda-Plisen, Russia's Atomenergo-export, and even smaller ones like the Vatra Dornei uranium mines in Romania-have a great deal of political influence.

And the organisations that, operates the existing reactors that provide 80 percent of Lithuania's electricity needs, half of Slovakia's and Hungary's and a third of Slovene and Bulgarian supplies, wield commensurate political leverage within the energy sector.

Double Standards

The main break on Western suppliers' enthusiasm is the issue of liability. Most East European countries have not yet signed the Vienna Convention, which holds the operator, not the supplier, of a nuclear facility responsible for damages in case of accident. Western suppliers do not want to be liable for billions of dollars if a plant they help to built suffers a serious accident. "It's a pressing issue for them," says IAEA spokesman David Kyd. "Until the liability issue is resolved, their legal departments are advising against involvement."

Completing of retrofitting Soviet-designed plants carries an extra degree of risk. Western assistance to complete Temelin and Mochovce has raised the issue of a double standard for reactor safety. A newly reunified Germany acted quickly to close the VVERs at East Germany's Griefswald plant, which were deemed unsafe and not upgradable. As late as 1995, however, the EBRD, Electric de France, and Bayernwerk were helping to complete Mochovce's reactors, which are identical to those at Griefswald.

Bayernwerk head Wild admitted in a 1994 newspaper interview that a plant like Mochovce could not be operated in his country: "Certainly no one would permit this kind of installation in the. surroundings of Munich." Similarly, Germany concluded that the nearly completed VVERs at Stendal could not be brought to acceptable safety levels, and that plant-which, paradoxically, is identical to the facility at Temelin in the Czech Republic-was also decommissioned. Meanwhile, backed by US government loans, Westinghouse is completing Temelin.

One problem with VVER-440 series reactors like those at Mochovce is there lack of containment. Experts interviewed for this article-including the head of nuclear safety research at a US Energy Department laboratory and the Canadian site manager at Cernavoda-agree that it is not feasible to backfit the reactor with containment, and that without such a structure, these plants would not be allowed to operate in North America. Temelin and Machovce-both less than 100 kilometers from Vienna-have been opposed by Austria, which has waged a stormy campaign against projects that it considered unacceptable risks to its citizens. Austria's threat to withdraw from the EBRD over the issue contributed to the bank's decision to abandon financing Mochovce.

Waste Not Want Not

Safety issue aside, mounting evidence suggests that nuclear power is not the solution to the region's energy needs. "We have an extremely energy-intensive economy, and we already have surplus generating capacity," says former Czech Environment Minister Bedrich Moldan. "If you have such a big invest: ment as Temelin, it will [deplete]the limited resources available for addressing the outrageous inefficiencies in our energy system."

> *"The Eastern nuclear establishment Is very Interested In maintaining their monopoly power, avoiding privatisation, stopping market reforms, maximising profits, and maintaining the options for*
>
> corruption"

There's plenty of room of for demand-side improvement. By subsidising energy and raw materials, and driving for increased industrial production, communist planners created a system plagued with waste and inefficiency. Poland uses two to three times as much as energy for the same output as West European countries; Romania, three to five times as much. Electricity is produced, transmitted, and consumed in a wasteful manner-homes lack thermostats, buildings and heating ducts are improperly insulated, and antiquated machinery and power plants squander vast quantities of energy.

"There is enormous potential for energy efficiency gains," says Diana Vorsaz, a Hungarian energy expert at Central European University's

environmental science department. "It's absurd to try to address the problems in our energy sector through increased supply. Demand can be reduced at a fraction of the cost while improving our economy and competitiveness." Vorsatz estimates that as. much as a third to a half of current consumption could be saved.

However, even if the West should decide not to help complete questionable plants, Russia may. After the EBRD abandoned Mochovce last year, Russia's Minatom stepped in. Slovak officials have backtracked on their pledge to close older, more dangerous units at Bohunice, and they have grown weary of Western scrutiny of safety upgrades and least-cost studies. Russia and a consortium of Czech banks are offering to help complete Mochovce at a fraction of cost.

A recent study by Centre for Strategic and International Studies warns that Minatom is emerging as an aggressive exporters, citing Russian activities in Iran, Cuba, and India.
Belarus may choose. Russia's Soviet-style reactors because they are less expensive than Canada's CANDU-6. Meanwhile will successfully market its plants in China

It looks like nuclear power plant inspection will be. a growing field.

By Colin Woodard
Bulletin of Atomic Scientists May June 1996

The Belarussian Necklace

Four frightened young girls
Waiting for their turn
Will it hurt? Will I survive?
The lessons quickly learned
They lie there in their beds of fear
It could be you or me, but they must
pay the price
For man's inhumanity.

Four frightened young girls
Want to live their lives
Want to find a sweepheart
Want to be young wives.
They want safety for their children
In a land that's free from fear
They. want to love and life and laughter
And a future they can face
With their children's necks unblemished
Not a Belarussian red necklace

Mags Whiting

Subscription Information

Rs. 30/- per year (6 issues) (within India)
U.S. $ 15/- per year or equivalent in other currencies for airmail overseas.
Rs. 500/-- for life (only within India)
This Issue: Rs 10/-

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add
Rs 10/-
Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Published by S.Gadekar for Sampoorna Kranti Vidyalaya and printed by him at The Parijat Printry, Ahmedabad.

PRINTED MATTES

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Anumukti: Volume 10. Number 1

August / September 1996

Koodankulam Reactors :

- A Bad Bargain !

Megaprojects never die. Neither do they, like old soldiers, just fade away But sometimes like an incurable cancer, they have periods of remission. With luck, these periods of remission can last for years. But then the inevitable follows and the prognosis is not good

Nuclear reactors at Koodankulam are a case in point. They have been in the news for donkey s years. Even during Breznev's time there was talk galore. A memorandum of understanding was signed and the site surveyed for transport of heavy equipment as early as 1988 That was the time when the people had a lucky break. Soviet Union, which was to supply the two thousand Megawatt reactors, collapsed due to its own internal contradictions of being a closed and autocratic system. The nuclear disaster in a newly built Soviet reactor at Chernobyl in 1986 and attempt by the Soviet leadership to suppress information about the catastrophe, also contributed. However, this time people have not been *so* lucky. If only the cardiac arrest of Deve Gouda government had come a few weeks early, people of Koodankulam and the rest of India would have been spared this assault for some more time Now. there is no alternative but struggle.

Regular readers of Anumukti are well aware that no kind of nuclear power plant is safe enough or clean enough or cheap enough for any society in the world. However, in the following, for the sake of discussion, let us grant that India is in such a dire need of electric power (a very dubious thesis in the first place) that there is no alternatives but to have nuclear reactors at Koodankulam. Even granting these absurd propositions, these reactors are a bad bargain by any reckoning.

First of all for the next twenty years at least they will intensify the power crisis. Studies have conclusively shown that nuclear power plants, if run very efficiently are net producers of energy only in the last few years of their existence. Indian nuclear power plants, which historicaily have run at 41 per cent of their rated capacity, are never going to be net producers of energy Thus undertaking to build a nuclear power plant is the surest way of deepening a power shortage into an immediate crisis

Secondly, these proposed reactors arc the wrong size. A study done in the US regarding the optimum size of a power station with respect to the grid size showed that for a 57.000 Megawatt grid, the best size of the plant was 100 to 150 Megawatts Having a huge sized plant in a midget sized grid is the surest way of ensuring that the supply is going to be even more unreliable than at present. The unreliability of the present supply, means an additional 15 percent loss of electricity as people (who can pay for it) try to ensure reliability through use of inverters and batteries And industry and small businesses try to exploit the kerosene—diesel subsidy by going in for diesel based generating sets

Thirdly, Koodankulam is a bad site It is located in the extreme south of

A Fate Worse than Chemobyl?

The diktat of the producers over the consumers was later identified by glasnost as the main weakness of the Soviet economy Lest we forget in Koodankulam, we are the consumers.

Soviet industry was incapable of building large pressure vessels required for the VVER (the type proposed for Koodankulam). That is why priority was given to the RBMK (the Chernobyl type) design. To provide an industrial base for VVER systems, Atommash was established to manufacture pressure vessels and other components.

Atommash was a key project in the Soviet energy programme. Due to political considerations (the region's party secretary was a close friend of Breznev), it was decided to locate the plant in Rostov region. Planners and builders were in such a hurry to build that they had omitted to make a proper geological survey of the site. It turned out to be unsuitable for the plant and the new town of Volgodonsk. They were built below a hydroelectric dam across the river Don. The chernozen soil was a poor protection against the pressure of the water mass above the level of the site. The area around the town gradually became a swamp. This was a fairly common problem with Soviet hydroelectric projects. (Tawa dam engineers- you arc not alone!) By the time the project was nearing completion, Volgodonsk was already a town of 100,000 people. So the problem was simply covered up.

In 1983. sinking foundations caused one of the plants huge walls to collapse suddenly.

From Zhores Medvedev's The Legacy of Chernobyl

It *is on the assumed competence of people with such an outstanding past record that we are willing to put not only ourselves but more so, our neighbours in Sri Lanka in jeopardy. - Editor.*

the country in a drought prone region. Water used for cooling the reactors (and huge amounts arc required) is to be taken from a dam which was meant for irrigation in this water scarce area. The farmers of the region were already up in arms against this hijacking in 1988.

Nuclear power plants by their very nature need large steady customers for their power. There are none such any where in the vicinity, thus the power produced here would need transportation over large distances to consuming centres thus contributing to the already huge transmission and distribution losses.

There are also international ramifications of siting the reactors at Koodankulam The Sri Lanka coast is just 20 kilometres away, and the decision is bound to create an additional source of friction in a relationship which shows signs of some improvement after being many years in the doldrums

Fourthly, the reactors arc the wrong design and have many safety associated problems Indian nucleocrats will no doubt point to the fact that they are not the Chernobyl kind. But it is a fact that before the disaster at Chernobyl. Soviet nuclcocrats were convinced that the Chernobyl design was in fact safer and better than the presently proposed VVER kind. (See Box) These have a narrow pressure vessel, with the result that the fuel elements lie much closer to the surface of the vessel. Constant impinging of high speed neutrons causes the vessel to become brittle with time and this could lead to catastrophic failure.

Having a large number of different reactor systems in India is in itself a safety hazard. Personnel have to be trained in handling these different systems and they are then of not much use in handling problems in other reactors. For a small nuclear programme like in India this diversification introduces additional unnecessary vulnerabilities.

But all these points arc mere academic quibbling. In reality, nuclear power plants are a dead technology. And costly to boot! In countries which allow the markets to decide the choice of technology, nuclear power is well on the way to joining the dodo. In USA, many even very efficiently run plants arc finding it increasingly difficult to survive in an open and deregulated market. Every month brings news of some group of utility executives deciding to shut down an operating nuclear plant and dash for gas and cogeneration. It is only in countries where bureaucrats and politicians have an incurable habit of squandering public money, that nuclear power gets considered.

If India wants to play Santa Clause to our poor cousins the Russians, let us by all means gift them two billion dollars. But why should we saddle ourselves with a non performing and dangerous poison producing plant in exchange?

Surendra Gadekar

Anumukti Family News:

By this time you may have received the Chernobyl Special Issue. As promised, the Aug./Sept 1996 issue is in your hands. We have not heard from most of you for over an year. The postcard price is still 15 paise, so do drop us a line confirming your correct address and communicate to us your interests and comments.

We are in the process of upgrading our address lists and we find that many of you arc yet to renew your subcriptions.

Anumukti Team
30/47/97

The Selge of Gorleben

The facts and figures arc self-evident and telling. It took the largest security operation in postwar German history—-the mobilization of 30,000 police—to move six radioactive waste transport canisters a few hundred miles from southern Germany to the northern farm town of Gorleben.

There, the casks are placed in "interim storage, inside a building that from the outside looks like nothing so much as a soft drink bottling warehouse.

Along the way to the small city of Dannenberg, the casks faced rail saboteurs, people blockades, and two people who cemented themselves to the tracks (the police couldn't remove them. and eventually removed and replaced the tracks instead).

At Dannenberg. the casks were lifted by a huge crane from the rail cars to trucks, in preparation for the final 14 miles of road transit into Gorkeben When the casks finally reached their destination 36 hours later, the costs were just beginning to be tallied

More than 150 demonstrators and 20 police were injured Some 500 people were arrested. At least 20.000 protestors were involved in the final stages, although the number across the country was probably far higher. The transport cost Germany, according to newspaper accounts, $100 million, not to mention the support of the police union, which has called for no more waste shipments.

And northern Germany, in an area known as Wendland, had become a war zone.

ANUMUKTI SALUTES
THE PEOPLE OF
WENDLAND

WHAT PRICE
THE
ATOMIC STATE?

SIX CASKS

173 INJURED

300 ARRESTED

20,000 PROTESTORS

30,000 POLICE

ONE HUNDRED MILLION

The facts and figures are easy: it is the atmosphere, the sounds, the feelings, the experience, that is much harder to describe...

Wednesday, March 5. morning
No Roads, No Waste

Mona. a German student and activist, and I walk to a small farming village about 2 miles from Dannenberg The CASTOR (Cask for Storage and Transport of Radioactive Material) casks have not yet begun moving, but they will soon—but not on this, the preferred road.

In the center of the village, about 80 tractors are parked together—some arc chained together—in a barricade passable only by brute force.

A mite down the road, there arc more barricades, made up of downed trees, dirt, concrete, and whatever local people could find Underneath the barricades, the road has been completely dug out—just a few inches of road and then holes several feet deep If the 100-ton CASTOR casks in to move down this road, it will collapse No. the CASTOR casks will not be using this road today, indeed, no one will be using this road for weeks, perhaps months to come

Above us. police helicopters circle constantly, the noise of their blades is so common by now that it is just background Over a public address system set up in a car parked in a farmer's front yard, there is an announcement Mona translates for me the helicopters may be landing, don't panic

But a few farmers do panic, and suddenly tractors arc moving everywhere. There is far more danger from the chaotic tractor movements than from, anything else we have so far seen

The helicopters land, and 40-50 not-equipped German police jump out and run toward the tractor barricade Before anyone can react, they begin slashing the tires and trashing the lead tractors—the lifeblood of these farmers

The townspeople quickly regroup and charge the police, who retreat running, perhaps embarrasedly. down a country lane The helicopters land again in a nearby field, and to taunts and angry gestures, the police climb back in the helicopters and fly away

The US couldn't have done it better in Vietnam And the police have made enemies for life of the people who grow their food And the casks arc not even going to move through here, the road is completely impassable and has been for days. It is harrassment and destruction by the police, pure and simple Someone yells out in black humor: call the police, someone is damaging our tractors. But. here, a few miles from Gorleben, in the midst of an undeclared war zone, the atomic stale has revealed its true colors it is a police state,

Lueneburg. Saturday, March I

International Problems Demand International Actions

Lueneburg is a beautiful, peaceful city of 60,000. Untouched by Allied bombing, many of its buildings date to the 14th and 15th centuries, and have been lovingly restored There is a university, and an activist student union which a couple of years ago decided there needed to be better international contacts among grassroots anti-nuclear activists.

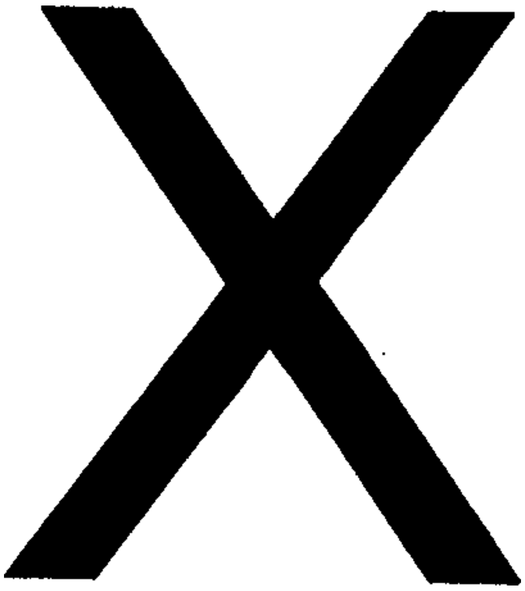
The first conference, held in March 1996. was not well-funded, but nonetheless brought together activists from about a dozen countries. It was considered a success, and this year, with a little more funding in hand, the conference titled simply the 2nd international anti-nuclear conference" brings together about 60-70 activists from 28 countries.

The conference was planned months ago. it wasn't until the last couple of weeks that organizers learned the CASTOR casks would be moving to Gorleben, just 40 miles away, around the same time The conference goes on. but with a bit of an edge to it.

On the first day of the conference, there is a large rally in Lueneburg. 15,000 people gather in a town square to oppose the radioactive waste transport Myself and Mario Wan/a from the South African Mineworkers Union, were asked to speak.

The day before, the Bonn government had warned protestors not to disrupt the CASTOR shipments. 1 tell the crowd that we in the U.S.. and indeed, the whole world, will be watching what happens this week. The crowd needs no German translation, it roars its approval

On the way to the rally, I did a littic quick math. The CASTOR protestors are trying to stop the shipment of specuclear waste casks. I point out that in the U.S., we are facing the possibility of the transport of six casks through Las Vegas every day for 30 years. The crowd boos and yells. And I conclude by saying that this is an international problem and demands international action. The crowd agrees. A few years ago, I didn't think that. Now, it is very clear: our concerns are the same, the companies involved are the same, the solutions arc the same. We must knit into a solid international movement if we are to beat the nuclear industry at its own game.



Gorleben Will Live

At the same time as the rally in Lueneburg, 10,000 more protest in Dannenburg Meanwhile, in Dannenburg. the police attempt to requisition a schoolhouse to serve as a temporary barracks. Too late: the schoolchildren have barricaded themselves inside the building and refuse to allow the police in. But the police move in force, and throw the children out of their school. The Dannenberg officials arc unhappy with the police. They refuse to provide them with water or electricity.

Tuesday, March 4

Every House Says NO!

We have become an official "observer" team, which mostly means that we can get through police lines. And there are plenty of police lines to get through. Roads are blocked off for miles leading to the Dannenberg/Gorleben area. But the police, mostly from out-of-the-area. don't know the region, and every direction sign has been blacked out by protestors. A few roads, mostly one-lane farm roads, remain passable

Traveling through the area, one fact quickly becomes clear: the opposition to the waste transport, and to nuclear power generally, is virtually unanimous The battle has been going on here for 20 years, since the government first announced it would build a reprocessing center at Gorleben. as well as interim and permanent waste dumps, and perhaps a reactor to power it all.

The area was considered to be conservative and not nearly as likely to block the government's plans as the more activist-oriented South. But proposed nuclear projects have a way of turning conservatives into activists. The reprocessing center has long been cancelled, and the resistance to the waste dumps is massive

The symbol of the movement is an X. Every farmhouse, every townhouse. every household displays an X. Some are quite elaborate, many arc yellow, made of wood. Some arc glass, some arc metal. Almost every house also has anti-CASTOR posters in its windows; many have anti-nuclear banners as well.

The War Zone demarcations become clear: police convoys barrel down two-lane farming roads while the residents promote active resistance.

Near the town of Guzborn. we have to stop. A mud and tree barricade straddles the entire road. Behind it. in the center of the road, is a 15-foot tall

X. made of steel girders, welded and cemented into the road. This baby animating.

100 yards further on begin the serious barricades, one after another, about 20 in all. In between them, the road has been hollowed out from underneath. There is nothing but air. In some places, the protestors have put in logs to hold up the road so they won't cave in on the people digging (hem out. A 100-ton nuclear waste cask cannot possibly go over these roads in the near future; indeed, no vehicle can. The CASTOR will have to go on the less-preferred. twisting route through several towns, or it cannot go at all.

Through side roads and police checkpoints, we everntually make our way to Dannenberg. where the casks sit on trucks awaiting movement. It is about 6 pm. the casks cannot move at night, so they won't move soon.

On the lane leading to the road from the crane, hundreds of people are lying in two-foot tall mounds of straw. They are the front lines: to reach the road, the police must move them first.

But for now. all is peaceful. Music is in the air. drummers play, people cheer. The police throw candy to the people in the straw

The casks arc remarkly unprotected. Only a few police nervously walk op and down a very small fenced-off area I walk to within about 12-15 feet of the six casks, radiation detector in hand. Within a minute, the detector has risen to more than 600 counts per minute, then more than 700—about 50 times background radiation levels. The radiation levels decline rapidly with distance though, at 50 yards, it is only five times above background, at 100 yards, there is no discernible radiation increase. Later. I learn that a Greenpeace scientist got a bit closer to the casks, and measured levels around 4.000 counts per minute—even above the levels near Chernobyl.

The thing is, in Germany houses are built right on the street, with just a narrow sidewalk in between These giant casks, tomorrow, was travel on narrow roads within just a few feet of bedroom windows and children's playgrounds.

But tonight the air is almost festive: one can almost forget about the sounds of the helicopters circling overhead We walk from the crane to the largest camp—there arc many camps spread out across the 14-mile route Each camp plans something different for the final transport

Along the road, people walk up and down, milling around There are bratwurst. soda and t-shirt vendors, it has the aura, if not the music, of in impromptu Woodstock But as the night wears on. temperatures drop precipitously. Thousands of people arc now in the straw area between the crane and the road, thousands more block the only road left. We have to leave, and after an hour's drive and an endless meeting, agree to be back to the area in six hours Time for just a little sleep

Wednesday, March 5

Water Canons and Harking Dogs

By 9 AM the removal of the people in the road is well underway Were quickly updated about I am. the police began moving and arresting people After three hours. they had only cleared 150 feet of people, so they turned ou their water cannons

These water cannons are mounted on giant armored. Star Trek-looking green tanks The cannons are operated by remote control from inside the bullet-proof protected cabs Their power is quite strong, but the protestors have come prepared, and are covered with plastic As long as the) don t receive a direct hit. it doesn't hurt too much and they don't even get too wet

The police train the cannons on a small group, to break down then usistanee then momve in to move and/or arrest the in one-by-one. But there are 9.000 people in the way now so arrests become impossible

Susan Lee. camera in hand, gets picked up by her hair and thrown across the road Krista. an activist now working in the Czech Republic against the Temclia reactors pets clubbed Others get off casier Still tension is building

During the night, a group of Autonomen — radicals perhaps not organized enough to be anarchists engage in serious streeifighting near the town of Quickbon along the only road the CASTOR can now travel That road has not been lorn up. and the radicals want time to set up barricades and dig under the road

The police arc not inclined to provide that tunc Rocks and slingshots are used, and molotov cocktails According to one report, a woman is critically injured Many arc hurt and/or arrested The barricades and digging don't take place The CASTORS eventually will move

Back in Dannenberg, we watch the water cannons pelt the people in the street. The police arc clearing about one yard of street per minute now.

Above the road, four people have tied themselves into the trees, with a giant banner. The police try to shoot them down with water cannons, but it doesn't work. The CASTORS cannot legally move underneath them, so a team of police goes up and tries to cut them down. This takes at least a half-hour, to the boos of thousands.

The understanding was that the protest would be non-violent. People would block the street, but once moved would not try to reclaim it. They want to show that the violence is caused by the police. The police use their water cannons, billy clubs and shields; here, the protestors simply join arms in resistance until they are moved off the road.

Finally the road is cleared, and thousands of police stand shouldcr-to-shouldcr to protect the casks. As the casks move out, we are cheered by reports that there are 2.000 more people sitting in the road at Quickborn, and 5.000 more chained across the road, at Gorleben

Nearby, there are various small confrontations between protestors and police, nervous, the police bring out dogs The barking reaches an car-splitting crescendo, but there is no serious trouble.

Thursday, March 5, Braunschweig
Chernobyl is Everywhere
That night. Ilya Popov of the Socio-Keological Union in Moscow and I speak to a gathering of people from the area, about our experiences in our own countries. Then, one-by-one. other members of our international delegation speak.

The First Nation Canadians speak in moving terms about what uranium mining has done to their communities. Ottis. in exile from Papua New Guinea for the past 20 years, brings tears with his tale of repression and death squads. From the Phillipines, Korea, Turkey, from across the world, activists tell their stories; they unload their fears and reveal their hopes. In front of these young German activists, the emotions of the past few days pour out.

The stories are similar: we truly arc in the same movement, but it has taken us longer to understand that than it has Westinghouse, or GE. or ABB, or Siemens or the other multinational nuclear corporations which buy and sell politicians like pork-belly commodities.

We each have our local and national battles and concerns, but tonight we truly have become an international movement, understanding each other, and united. It's a feeling unsaid, but shared, and one we hope will stay with us.

Sunday, March 9, Washington DC
The Sunset of the Atomic State
Back in the USA, having dealt with lost passport and plane ticket—the less said the better...

Most countries, including the U.S., arc not yet attempting to move radioactive waste across their nations. Thus, the Siege of Gorleben is hardly an end. it is just a beginning. The first CASTOR shipment into Gorleben took place less than 18 months ago; it brought out about 2,000 protestors and cost the German government about $ 15 million'The second shipment cost more than $40 million, with 9,000 protestors and more than 15,000 police.

Crowd estimates arc notoriously unreliable even in a small area, over a 14 mile road, they arc impossible. But there were at least 20,000 protestors, and admittedly 30.000 police to usher the new casks into Gorleben

So it has cost Germany more than $150 million to move eight casks—and the original plans call for the shipment of 412 more casks to the Gorleben "interim" site.

Where does it stop? At what point does the German government, or any government, say 'this is it, we can't do it anymore.'

In Germany, even the police are r belling. At Lueneberg, and again at the gates of Dannenberg, the "Critical Police" appeared—police refusing to take part in the quashing of the demonstrations; refusing to walk for hours next to the highly-radioactive CASTOR casks. Indeed, the police have called for an end to the shipments.

Without the police state on its side, how can the nuclear industry expect to take its lethal garbage anywhere?

The CASTOR casks only traveled about 300 miles. In the U.S., if radioactive waste transportation begins, many casks could travel nearly 3.000 miles. Eventually, we all will have to make our stand, and it may be sooner rather than later. Most politicians in the US want radioactive waste transportation to begin, because they are beholden to the nuclear industry.

The transportation of radioactive waste is not just a routine industrial maneuver. It is a defining moment It is our opportunity to expose the nuclear age. and to assert its end.

No government can withstand the costs of Gorleben for long. No government can long withstand the divisions among its people, the alienation of its farmers, the devastation of a War Zone inside its borders.

There is but one obvious path, one poorly-understood by the Governments, but well and truly grasped by the farmers of Gorleben: we must stop making lethal poisons simply in order to generate electricity: our lives, our nations, our futures are all too important for that.

Michael Marriot
The Nuclear Monitor
March 17.1997

Democracy Zindabad!

Sweden gets around 43 per cent of its electricity from nuclear power. On March 19, 1980, the Swedes held a referendum on whether to continue down the nuclear path. The result was a victory for a scenario for a phase-out of nuclear energy by 2010. The nuclear industry invested 20 million SwK (6 million 1980 USS) in the referendum but got only 18.7 percent of the votes. The antinuclear line (rapid phase-out) received 38.6 percent, but the Social Democrat line (long-term phase-out scenario) got 39.8 percent Long term phase-out meant that business could continue to proceed as usual and big businessmen and politicians felt that in time people would get "educated" on the benefits of this wonderful source of power.

Unfortunately, for these power brokers, things haven't worked according to plan. The accident at Chernobyl in 1986. severely affected parts of Sweden's forest land and especially the reindeer herding Lapp community That put paid to any hopes that the referendum result could be overturned in the future

But despite the people's verdict, not much action had taken till now as politicians bickered amongst themselves and felt that there was no "viable" alternative to replacing half the country's electricity supply.

However, with time running out, there has suddenly been some movement in the right direction. The nuclear power plant at Barsebaeck. located in South Sweden and only 20 kilometres away from the Danish capital Copenhagen, will be turned off The first of its two 600MW reactors will be stopped before July 1998. the second before July 2001. This decision was arrived at a midnight meeting on February 4. 1997 in Stockholm between Social Democrats. Centre party and the Left wing party. The parties have a majority in the Swedish parliament. The agreement came after months of intrigue and is a major victory for the antinuclear Centre Part The ruling Social Democrats were prepared to wait until early in 2000 to begin decommissioning on 1998 as deadline This victory of the Centrists is likely to change the face of Swedish politics since till now the Centrists have usually been part of a block in opposition to the governing Social Democrats The news was a special treat for the Danish population who celebrated with relief They had been opposing the plant for well over twenty years

However, the fight is by no means over as yet Sydkraft. owner of both Barsebacck reactors, says it would seek compensation for loss of electricity production According to VEBA. the German energy conglomerate which owns 27 percent share in Sydkraft via its 100-percent subsidiary Preussenelektra AG. is satisfied that the whole affair is a bag of wind —and are betting that despite the decision the reactors would not be prematurely closed After the announcement of the decision. Sydkraft's shares rose sharply as investors perceived that it would not have to bear liability for the decommissiong of these old reactors.

The negotiating politicians agreed that reactor owners should be liable for all costs in the event of an accident, instead of the government stepping in to cover costs above a certain low ceiling. Currently, ractor owners arc liable for a maximum of 1,2 billion Kroner (US $ 17 million) in third party damages per accident The idea behind the proposed change is to make it economically infeasible to run the older reactors—for whom accident risks are presumably higher and thus force the utilities themselves to decide to close the units, rather than the government specifying which unit should be shut first

Big business showed its contempt for democratic values explicitly Beri-Olof Svanholm. who is chairman of Volvo AB and head of the Federation of Swedish Industries has said that any decision to close Batseback will be fought, and we will never accept that the country unnecessarily throws away SwK 20 to 30 billion **(US$ 2** 7 to 4.05 billion) while we chop wood to meet our energy needs

Meanwhile in Japan

Over half of all Japanese citizens have lost confidence in then governments statements concerning the safety of nuclear power, according to the latest survey conducted by the Research Council for Energy and Information Technology in October last year The figures which showed that 57% of people surveyed had little or no confidence in government statements on nuclear energy, comprise the lowest vole of confidence since the surveys **began (The Aikket Weekly**. 1 March 1997

A petition to permanently close down the Monju fast breeder reactor which suffered a serious accident from a liquid sodium leak and resultant fire gathered over a million signatures On May 14. 1996 Science and Technology White Paper a publication that usually gives an overview of the general research scene specifically scolded Monjus owner, the Power Reactor and Nuclear Fuel Development Corporation for its inappropriate" post-accident behaviour

Nucleomax Week May 16 1996,

Upsurge of Revisionism Regarding French Nuclear Success

France is the model nuclear "success " story. A country which following the Arab oil shock of J 973, decided to go in for nuclear and went with vengeance. The nuclear establishment was given ***a*** *free hand and it "delivered". But hindsight as they say is 20-20. It does offer a better perspective. Energy experts, the courts and the research community are now finding that may be this headlong rush into nuclear wasn't such a bright idea after all.*

Et Tu IEA!

It is time for reorientation of French energy policy, the OECD Internationa) Energy Agency (IEA) said in a new review.

In the view of the experts who authored 'Energy Policies of IEA Countries: France, 1996 Review, French energy policy "has reached a watershed" and needs deep reform if the country is to meet IEA policy goals associated with open markets, energy efficiency, and fair competition among fuels. In essence, experts say. France's emphasis on nuclear power has led to a lopsided, inflexible supply structure in which electricity use is excessively promoted, creating severe interfile! price distortions.

Further, they say, the concentration of 90% of government research funding. 80% of commissariat a I' Energie Atomique expenditures, and 50% of Electrieite de France's (EDF) research budget on nuclear has starved other sectors for research and development funds and pulled qualified people away from other areas of scientific research, including energy conservation and renewables.

The IEA reviews on France, the second the agency has done since France joined in 1992. was led by Hans Schimid. deputy director of Switzerland's Federal Energy Office. Susan Harrison, of the Electricity Division of the UK's Department of Trade & Industry, was co-rapporteur. The team had members from Norway, the OECD Nuclear Energy Agency, and the IEA secretariat.

In looking specifically at France's nuclear program, the IEA experts observe that "decision on its development have been taken centrally, with little or no public participation or involvement of the parliament." They say this situation probably cannot continue if France is to renew its nuclear installation in the future, and recommend steps towards greater openness and public participation in energy decision making.

The review also warns that the "inflexible and the rigid power production system" resulting from nuclear plant overbuilding "may be exacerbated by the addition of four reactors currently under construction." The experts note that choice of future gencrating technology will "in principle be decided by Market" and that nuclear will have to compete alongside non-nuclear options "even for baseload capacity"

The IEA team also recommends that France "finally decided on the future role of Superphenix as an experimental facility, taking into account the age and technical characteristics of the reactor and related investment and operating costs."

Source: Nucleonics Week

Come Hell or High Irregularities

As it is nuclear power is usually the most expensive option. But fast breeders take the cake. The electricity they produce is more than twice as expensive as that produced by other (non-breeding) nuclear plants. The French for militaristic reasons went in with a great deal of nationalist fervour in launching Superphenix—the only commercial sized breeder in the world. Breeder reactors produce more plutonium than they consume uranium and thus can theoretically produce large amounts of electricity from very limited supplies of raw material. However, ever since its launch in 1986, Superphenix has been plagued with problems. It never even managed to run consecutively for six months together. It spent most of its time in a state so familiar to reactors in India—shutdown. French regulations require relicensing of power plants which have remained in a shutdown state for more than two years. In 1994, the French atomic energy establishment finally gave up the ghost of breeding. However, with billions already down the drain, they were loath to take the sensible option and let it all go and decommission the plant. Superphenix was resurrected as a non-breeder for research and demonstration purposes. Recently, France's supreme court has annulled the operating licence for Superphenix on the grounds that the licensing decree issued in 1994 assigned the reactor with a 'new' pur-

pose - research and demonstration - not covered in the 1992 restart application and dossier submitted for public inquiry by operator NERSA. The 1240 MWe reactor is currently offline. The French government has re-emphasised its commitment to keep the reactor operating, and is considering either holding a new licensing process to support the 1994 decree, or issuing a new decree more in line with the 1992 documents, which emphasise the reactor's use for electricity generation
Sources: Nucleonics Week

We De Have *An Address!*

In fact, we have two. A regular postal address and an email address for the other set. Although the cost of writing even a post card has gave up considerably, a letter does feel nice. So do let us know if you like what is in your hands and even more if you don't like it. But most of all definitely let us know in no uncertain terms if you don't receive your regular copy every two months. It is usually our fault.

LEUKAEMIA AROUND IA HAGUE NUCLEAR FACILITY

French Environment minister Corinne Lepage and Secretary of State for Health Herve Gymard announced January 10. 1997 that they will commission a thorough epidemiological study of cancers around the La Hauge reprocessing plant in Normandy. Their decision followed publication in the latest issue of the British Medical Journal(BMJ) of data claiming that children who played on beaches near La Hague at least once a month exhibited almost a three fold increased risk of developing leukaemia.

Eating local fish and shellfish at least once week was tied to a similar increased risk, according to the study by Jean-Francois Veil, a professor of biostatistics and epidemiology, and Dominic Pobel, a research epidemiologist, at Besancon University's Faculty of Medicine. France.

The two French scientists claimed 'convincing evidence" of a causal role played by exposure to environmental radiation at the seaside, but found no association with parental occupational radiation exposure. They recommended that researchers look for new environmental radiation pathways, particularly in the marine ecosystems

They had originally set up their study to investigate any association between La Hague and local cases of childhood leukaemia In a previous study. Vicl had been unable to establish any clear statistical link

The scientists' methodology came under immediate criticism in the influential newspaper, Le Monde, by Jacqueline Clavel. an epidemiologist with France's National Institute for Health & Medical Research (Inserm), which co-financed the Viel work.

Inserm s name has been linked by the French media to the newly announced study, but neither Inserm nor government ministries would confirm that the organisation had been chosen to conduct the project. Details are expected to be announced in early February.

La Hague encompasses several facilities. Adjacent to La Hague reprocessing complex is a site now operated by national waste agency ANDRA, the centre de stockage de La Manche. which began receiving radioactive waste (all except highly active waste) in 1967 and was closed permanently in 1994 Both sites have been long under attack from environmentalist who allege pollution of the environs The Andra site has been shown in an Institute de Protection ct de Surete Nucleare (IPSN) study to have been leaking radionuclides. notably tritium, into two small rivers which cross it. one of which flows to sea

In addition, a nuclear power station is situated some 16 kilometres away, while the navy dockyards, where submarine nuclear fuel is handled, are 19 km away Both these facilities arc well within the 15-km radius of La Hague set by the study

Clavel faulted Viel's mode *of* recruiting control group witness via medical general practitioners and questioned the "quality" of this group But 'the main question." she said, is that of the applicability of the case study group to the problem raised whether the leukaemia cases were linked to the radioactive discharges

She said the study didn't say how Tar from the sea the ill children or the control group lived, and didn't name the beaches. The doctors should have tried to estimate the doses that could have led to the effects observed, she said.

Catherine Hill, another Inserm researcher, suggested that the method used to recreate activities—interviewing parents of children with leukaemia—was "dangerous " because not every one can remember how often he or she went to the beach 20 years ago. for example, nor know for sure the origin of shellfish eaten.

Viel told Nucleonics Week that it was "absolutely wrong" for outside observers to suggest that the leukaemia subjects were living closer to the sea than the controls, thereby being more prone to play on the beach and eat seafood more often.

The cases of leukaemia diagnosed between 1978 and 1993 in people under 25 and the 192 controls were matched for sex. age, place of birth, and residents at the time of diagnosis, he said.

Matched residence meant that they were living within the same electoral ward, he said because of the criticism by such experts as Clavel, he is preparing map markings of the individual dwellings to prove no geographic bias exists, heard, "I'm totally sure that we won land anything of significance," he insisted, adding that he expects to present the results in a future issue of the BMJ.

As for quality of controls, a glance through the tables should be enough to confirm very little difference between both sets of parental social classes, he said.

Veil said the strong link between leukaemia occurrences and the sea had taken the researchers by surprise. The more frequently a child visited the beach or ate seafood, the higher the risk the child faced of contracting leukaemia, he said. Such a dose/response relationship could not be put down to chance alone.

His and Pobel's research also does not stand in isolation, he said. The same marine phenomenon had been shown to be present near the Dounreay reprocessing plant in northern Scotland, he said in a study by James Urquhart of the Scottish Health Service published in 1991.

Viel said criticism such as not naming beaches were obviously easily made by others after the study's completion, "I was absolutely not expecting such a result regarding the use of the beaches to be so significant.'* he said. The researchers had therefore not complied a detailed breakdown of beaches visited by the children. "On the other hand, I have been criticised because 1 have already used 173 different items. So there are two opposing criticisms I have to face."

As for Hills concern about possible bias in recalling past recreational activities. Veil said he thought it unlikely to be a factor as both case and control mothers had not been aware of the significance of beach usage until after the data had been compiled and conclusions drawn.

Source: Nucleonics Week

Reclaiming Community Accountability

As a result of an open-records program initiated by the United States Department of Energy (DOE) Secretary Hazel O'Leary. information is being made available for the first time which is useful in calculating the radiation and hazardous chemical exposures of worker populations and ordinary' citizens in communities which arc home to nuclear weapons plants and related facilities. Until now. few have recognised the national scope of health effects studies which arc likely to become more significant over time.

A virtual,constellation of federal health agencies are now conducting "dose reconstruction" and parallel health effects studies at Hanford, Idaho Falls. Fernald, and Savannah River. Other sites will soon follow. The agencies include the Centre for Disease Control (CDC), National Institute for Occupation Safety and Health (N10SH). and the Agency for Toxic Substances and Disease Registry (ATSDR). While the Department of Energy's open-records program has made these studies possible, the work by federal health agencies has befuddled citizens' groups now isolated from each other by geographic distances and a lack of understanding that a national health research program has grown up in their midst without anyone realising it. Workers and citizens who encounter researchers from the federal agencies have asked four common questions:

1. Are we exposed?

2. Are we affected?

3. Did exposure contribute to or cause disease?

4. If we are not affected now. will we suffer later?

It may be difficult for citizens to get answers. The scientific work being done by these agencies to document and calculate exposures to radiation and hazardous chemicals is fraught with uncertainty, politics, organisational confusion, and doubt that anything more than "inconclusive" results wilt be the outcome of years of effort The responses of federal health agencies have been inconsistent, and in some cases, downright hostile, in terms of answering the four questions.

Some of the reasons are lack of funding, weak management, the arrogance of scientific researchers uncomfortable over answering fundamental questions from lay persons, and the bureaucratic agendas that distract the focus of otherwise sympathetic agency managers inward like the gravity field of a black hole.

Perhaps most daunting is the fact that there is no national independent clearinghouse that pulls together information on progress being made or collects and distributes information on lessons learned on the most effective ways citizens can respond to the conduct of health effects studies and federal agencies. Several efforts which deal broadly with environmental health studies have been developed, such as the Science and Environmental Health Network (SEHN). What has not yet happened is for citizens to organise a national response to a national program of health effects studies being conducted at nuclear weapons complex sites. This article suggests a next step for non-governmental organisations.

Citizens with basic interests in the outcome of the health effects studies face several essential challenges:

1. Make sense of the scientific knowledge and methods being used by federal health agencies.

2. Focus on the four questions of concern which are being asked by those still living in communities around the site.

3. Pressure federal health agencies which are not doing their job to get their act together.

What Should Be Done?

1: Convene a national conference of NGOs and citizens is to achieve several objectives. These are:

(a) Understand the current and future scope of federal health studies related to the legacy of the cold war.

(b) Establish a national agenda involving performance and qualitative standards for openness, public participation, and accountability for health effects studies

(c) Mount a lobbying campaign with Congress to embed these requirements in enabling legislation for federal health agencies

(d) Develop oversight mechanisms to ensure that federal health agencies are responsive to their congressional mandat

(e) Obtain resources for and roll out a national communications strategy to alert the news media about the national health effects study program Develop communications tools, such as the Internet, to alert citizens' groups about lessons learned and more effective ways to interact with federal health agencies

(f) Develop mechanisms for recognising the contributions which can be made by citizens interested in pursuing environmental science This should include training and technical assistance program for citizen activists on how to collect, analyse and distribute scientific information. Most importantly, citizens need help in recognising the significance of scientific findings, knowing what to look for. and how to critically engage scientific experts in dialogue which would produce shared understanding of the results of health effects studies. Funding will be needed to ensure grassroots participation in the conference and in the implementation of an action agenda, described below

2: Develop a clearinghouse of NGOs and citizens groups to carry out these tasks. This can be a virtual organisat ion rather than a physical one. but each NGO must put its oars in the water. The clearinghouse must put up an Internet presence via email. WEB site, etc . and also publish a hardcopy bulletin of news, resources, and action items for a national, co-ordinated response to federal health effects studies at nuclear weapons sites The clearinghouse must function as an "honest broker" despite the many priorities and agendas of NGOs and grass roots groups.

V Engage federal health agencies in a dialogue to change the behaviour of people as well as their respective organisations it makes no sense to address policies without the people Hearts and minds of agency staffs, and their contractors, inevitably follow the leadership of the agency organisations The mindset and credibility of federal managers must be examined, and changed for the better, if the resulting health effects studies are to be successful in achieving their goals Citizens can call for "boycotts' of agencies, such as a Virginia group did with ATSDR. but there is no long-term future in death spirals of reciprocal allegations of deception and rancour Everyone loses

4 Commit to the long haul Environmental epidemiological studies are like rocket science Achieving shared understanding of the scientific methods and citizens' concerns will take years After all, the horrors of the nuclear weapons complex took more than four decades to come to light. It may take a lifetime to recover

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A millenia of genetic change compressed in a few years

Studies Find Gene Mutations Higher in Chernobyl Victims

In our last issue (Special issue on Chernoby had an article by Dr. Rosalie Bertell on "Nuclear Thinking ". It argued that radiation injury issues are actually human rights issues and hence political issues. Solution to such problems can only come through political action. Specifically, radiation injury issues are not technical issues any longer. The following article taken from Nucleonics Week *—a trade journal is a good example of Nuclear Thinking. The radiation community finds radiation related activities so profitable, that it refuses to accept studies which show the effects of radiation to be far more detrimental than postulated by these worthies.*

A Russian-Belarussian-British research team has found twice as many genetic mutation in the offspring of parents living on contaminatcd territories around the Chernobyl plant site than in a control in the UK

The team, which includes Yuri Dubrova and Alec Jeffreys of the University of Leicester, studied 79 families inhabiting heavily polluted rural areas" of the Mogilev district of Belarus, about 250 kilometres north of Chernobyl, among which all the children were between February and September 1994. and a control of 105 families in the UK Using a technique developed by Jeffreys that measures the mutation rate of "mini-satellites"--specific genome site that features an usually high number of repetition—the research team found a " statistically significant twofold increase in mutation frequency in the offspring of irradiated parents, "they wrote in April 25. 1996 issue of the British journal *Nature* The mutation was measured compared to the parents genes,

The scientist said that the mutation rate in the Mogilev families was correlated with the level of caesium-137 surface contamination, thus concluding that the mutations have been induced by radiation. However, they were not correlated with individual doses received by the population

In the same issue *of Nature,* a team from Texas Tech University and the Savannah River Ecology Laboratory, led by Robert Baker of Texas Tech, reported 'high levels of genetic change" in rodents—two species of vole—living next to the Chernobyl plant, in comparison to a control group living in a relatively clean area about 32 kilometres Southeast of site.

The results had not been predicted by existing models of the effects of radiation. In the case of voles, 'the estimated substitution(mutation) rales were at least two orders of magnitude greater than any previously reported for mitochondria proticn-coding genes," said David Hills of the Department of Zoology at the University of Texas, Austin in accompanying *Nature* commentary

But observes cautioned against drawing firm conclusions about the eventual impact of the genetic changes on the health or gene pool of cither animals or humans in the area. Especially in the case of the study of human gene mutations, they said, it would be necessary to follow up the work by Dubrova et al. to confirm that the mutations indeed correlated with radiation dose and are not caused by other environmental aggressors which were not studied specifically.

The publication of these results on the eve of Chernobyl accident's 10th anniversary was certainly not by-chance, said one French Scientist, adding, "N*ature* played its cards right." Nothing was said about their work of the two research group in the major multi-agency conference on "Chernobyl: One Decade Later." held in Vienna April 9-12. Working papers from that conference did. however, highlight the genetic change observed in animals and plants close to the reactor site—which were said not to threaten the region's ecosystems—as well as the potential for genetic mutations in humans, probably also not posing a significant threat.

Philip Vision, a geneticist at the French Institute for Nuclear Safety & Protection (IPSN), said that gene mini-satellite were discovered in 1980 and five years later. Jeffreys pioneered their using confirming parental relation between individuals by studying "genetic finger prints". The mini-satellite vary greatly between unrelated individuals, with very slim chances of finding the same pattern, but they are quite stable from parent to child. The length of mini-satellites can be measured by probe, establishing whether they contain the correct number of repetitions or not: in the later case, the researchers say a mutation has occurred

In the study of Mogilev residents, Dubrova et al. found that length changes in nuclear mini-satellite loci were about twice as common in the Belarus children (compared to the parents; loci) than in their UK counterparts. They found good correlation between the highest mutation rate and the areas in the highest median ground contamination. The total mutation rate was 1.5 times higher in more-contaminated areas (over 6.8 curies per square km) than in less-contaminated ones (under 6.8 Ci/km2), they said.

However, the research team members acknowledged they had not been able to correlate their findings with individual doses received by the stud) group—those dose levels "are not known," they wrote. Moreover, although the correlation with surface contamination is consistent" with the possibility of Chernobyl-caused mutations, they added, "it is possible that other non-radioactive contaminants from Chernobyl, such as heavy metals, could be responsible for the observed, apparently dose dependent increase in mutation rate."

IPSN's Voisin said it was "a pity" that the scientists had not made a greater effort to find a control group within Belarus, rather than going to a rural area in the UK that would not be expected to have the same spectrum o: contaminants, cither radioactive or chemical. Because the role of chemical pollutants had not been taken explicitly into account in the study, he said, the results "are to be considered with caution." even if the study represents "an interesting, advance" in knowledge about the h effects of radiation.

Scientists studying radiation health effects have stressed that, although genetic mutation were observed in offspring of survivors of the Hiroshima and Nagasaki atomic bombings, no lasting hereditary were observed In the case of Chernobyl contamination, that may also prove to be the case, they say.

Indeed, few people realise the size of the background rate of genetic mutations, said Fred Mettler of the radiology department at the University of New Mexico. He told journalist attending the Vienna meeting that about 2% have a serious one. and 1%. a defect that can be fatal

More generally, there is growing recognition in the scientific community that the health-effects lessons of the Hiroshima and Nagasaki bombings may not be applicable to the other radiation accidents. In his Nature coinmentary. Hills argued that the fallout from Chernobyl is so different in both diversity and extent from the Japanese fallout that "predictions from one to the other arc not likely to be very meaningful The studies of Chernobyl." he went on, are therefore providing the first glimpses of genetic effects of severe nuclear accidents' - effects he suggested bolt down, at least in the case of the Chernobyl rodents, to the "compression" of millennia of genetic change into a few years

While scientists generally agree that more research is needed on the question, some wonder where the emphasis should be placed Voisin said that, at the annual meeting of the International Radiological Protection Association immediately following the Vienna Chernobyl-consequences conference. Dan Benmson, former chairman of the International Radiological Protection Commission, publicly raised the question of whether vast new studies of the effects of low-level radiation are really worth the money and effort that they will necessarlly entail

Ann Macliachlam.
Nucleonics Week May 2 1996

"Not Now Not Ever"

Thoughts From *An Australian Abolitionist*

I has been a very exciting year for abolitionists of nuclear weapons. We have seen in succession, the International Court of Justice decision on the illegality of nuclear weapons, the passage of the CTBT. the report of the Canberra Commission, the Malaysian resolution in the UN Genera! Assembly, and statements by top military people in favour of abolition. All this has made it appear as if progress toward the abolition of nuclear weapons is no more than a matter of time. Yet recently, much of the impetus toward abolition has seemed to wane, at least at official governmental and UN levels. The Malaysian resolution' welcoming the IC J decision passed the UN General Assembly with the expected comfortable majority, but most of the western nations (including my own. Australia) either voted against it or abstained (India voted in favour.) On the other hand, preliminary negotiations to set up a verification regime for the CTBT have ended in disagreement, progress towards a fissile material production ban scents to have stopped altogether, and other measures toward abolition recommended by the Canberra Commission (taking weapons away from their delivery mechanisms, and taking no clear forces off alert as well as further deep reductions in US and Russian weapons levels do not seem to be taking place at any discernible speed

Meanwhile, a number of negatives have appeared on the scene, of which the greatest is probably US plans for subentical nuclear tests in India.

there are rumblings to the effect that if the US indulges in subcriticals, India may start testing. People I spoke to in Delhi attested to this.

The ICJ Decision

The decision of the International Court of Justice on the legality of the use or threat of nuclear weapons had in effect. three components: (l)The ICJ found no situation in which it could conclude that the use of nuclear weapons in war. or the threat of their use, was legal. (2) The ICJ concluded that the use or threat of nuclear weapons in war is generally illegal because it violates internationally agreed laws of war that have stood since the 1920s. The only caveat that the ICJ made to this was that it was unable to agree that the use of nuclear weapons could be legal in the most extreme circumstance of self-defence. (3)Thc ICJ concluded unanimously that there exists a legal obligation on the part of the weapons powers to negotiate in good faith and to conclude an agreement to eliminate nuclear weapons. It was this that the Malaysian resolution' tried to turn into practical reality later in 1996.

The ICJ decision has potential implications that are very far reaching indeed, but they have yet to be tested in a court of law. For example, it has been argued since the decision in the UK. that the UK's nuclear missile submarine patrols arc illegal as they represent a threat of use' of nuclear weapons. It is argued that NATO first strike' doctrines arc illegal, and that changes in US and NATO nuclear doctrine to no first use', argued for in the report of the Canberra Commission, arc the only legally correct response to the ICJ decision short of actual elimination of nuclear weapons. It has already been argued successfully by 'For Mother Earth' in a Belgian court in a case of trespass on a NATO weapons bunker, that civil disobedience against nuclear installations is legal because the installations arc in fact illegal.

However, the weapons powers, after trying to prevent the resolution under which the question of the legality of the use or threat of use of nuclear weapons was referred to the court in 1995 from being passed, and after alternat darguing before the court that the dart had no jurisdiction and that the use of nuclear weapons was a legitimate use of the right of self-defence under the UN charter, have done their best to ignore or evade the consequences of the ICJ decision. The US, UK, and France, have all argued that since their nuclear weapons are all of a 'defensive' nature, and all make use of the doctrine of deterrence, that the ICJ decision has no consequences whatever for them. It is significant and disturbing, that General Sundarji argues in the May 1996 number of 'AGNI'. the journal of the Forum for Strategic and Security Studies that 'The international Court of Justice has recently ruled that the possession of nuclear weapons is not illegal'. True, the ICJ decision does not say that, but the ICJ opinion comes very close to that in saying that use or threat of use is illegal, except under very narrowly defined circumstances where the court can't make up its mind! What General Sundarji (like the major weapons powers) did not acknowledge is that the ICJ came up with an opinion in which no legal use of nuclear weapons is identified, and says so explicitly.

Only Canada So far has suggested that it may have to 'review' its position under the US nuclear umbrella as a result of the ICJ judgement. Time will tell however, whether the ICJ decision will be tested in national courts of law, and whether in particular, doctrines of 'first strike' could be found illegal.

The Comprehensive Test Ban Treaty.

The CTBT has been hailed as the way to universal salvation from nuclear damnation or at least as the first step toward abolition, and damned as a machiavellian attempt by the weapons powers to hang on to their existing monopoly by preventing others from testing.

India has refused to sign the CTBT 'not now and not ever', claiming quite correctly that it allows the nuclear powers to continue warhead development. However, India's criticisms cover a scarcely-veiled desire to test itself, and my discussions with some influential people in Delhi certainly made it plain that this desire is very real in at least some quarters. The thinking there is that India, if it tested, could well withstand the resulting embargo, and that Pakistani capabilities could safely be ignored. In addition, a need to test if India is to weaponise the device it tested in 1974 is argued.

This may be dangerous nonsense, but some at least do believe it. The Forum for Strategic and Security Studies, a Delhi 'think-tank' argues that had the 1996 session of UNGA failed to pass a resolution in favour of a nuclear weapons convention. India should look to its strategic interests' -and test. Whether the Malaysian resolution, which advocated negotiations toward a nuclear weapons convention, is deemed to be sufficient is a good question. The series of subcritical tests planned by the US might be the next 'trip-wire'.

The CTBT is neither exactly salvation nor damnation. Depending however, on what happens after the CTBT. it may become a rather early milestone on the road toward salvation if indeed we are headed in that direction at all.

What the CTBT actually does is simply to prevent explosive nuclear tests in which the quantity of fission energy released exceeds that of any high-explosive charge used to implode the fissile material. In effect, this works out at about 4Kg of TNT. This means that explosive above-ground or underground tests of the kind that recently were undertaken by France at Muroroa atoll and very most recently (on the very eve of the signature of the

CTBT in fact) by China at Lop Nor, are now illegal. Whatever the other flaws of the CTBT, this has to be a plus for abolition.

The CTBT does not contain any commitment to a timed framework' for abolition of nuclear weapons, or for negotiations toward abolition. Nor does the CTBT place any restraint whatsoever on testing other than explosive and 'hydronuclear' testing (where it is ambiguous). The US, technically, is thus quite within its rights to conduct a series of subcritical' tests of zero or near-zero fission yield (whatever that may mean) at the LYNER facility in Nevada.

In fact, subcriticals are the least of what is allowed under the CTBT. A whole range of multibillion dollar facilities now exists in the US. under the Science-Based Stockpile Maintenance' programme, including the Dual Axis Radiographic Hydrodynamic test facility (DAHRT) which takes high-speed 3-d x-ray photos of plutonium and uranium bomb components under explosive deformation, an essential component of weapons design and the high-powered laser facility nominally for use in fusion research, which may also be of use in weapons design. France also has similar laser facilities. The lack of any restraints in the CTBT over testing of this type, has resulted in accusations that the CTBT merely institutionalises the dominance of the existing weapons states.

Besides, the CTBT has an opt-out clause. This allows a state to test simply because for whatever reason it feels it no longer has confidence in some component of its nuclear arsenal

Finally, there is the question of the Entry into Force' (EIF) of the CTBT, which as so much vexed India. The current provision for entry-into-force(EIF). whereby 44 named countries must ratify the treaty before it can actually become fully legally binding was included at the insistence of the UK and Russia, precisely in order to fatally weaken if not sabotage the treaty. There is thus a great deal of truth in the arguments that the CTBT fails to deliver on a timed framework for the elimination of nuclear weapons, and that it allows to of the kind that the weapons power are best equipped to do.

Other nations besides India, (notably Bangladesh for financial reasons), have indicated reservations about ratifying the treaty. Indeed, while it might be possible to induce Bangladesh to ratify with some form of financial 'sweetener', big questions exist over whether in fact, the US congress, still dominated by the republican right which has explicitly damned the CTBT as contrary to US National interest' will allow ratification and of course whether a paranoid and nationalist Russian Duma will do so

The fact that the CTBT will most likely never enter into force does not wholly rob it of value. It still provides a very strong political barrier to actual explosive testing and to some extent even to subcritical testing Any nation that tested from now on would be faced with international opposition and condemnation (and probably sanctions) that would make the storm over French testing look like one in a very small teacup. In other words, for all its flaws, and there are many, the CTBT does provide a political and to some extent a legal, barrier against testing. The real impact of the CTBTs failure to enter into force lies in the fact that until it does so, the CTBT verification regime will function on a voluntary basis only.

John Hallam

Last and final call?

Another All Fools Day and the reactors at Tarapur (Rhymes with Bhago—Dur in Hindi) are a year older They are already well past their 25 years design lifetime, and Dr. Gopalakrishnan had informed the nation more than a year ago. that they badly need to be inspected for core shroud damage and India does not have the technology to do so However, our nucleocrats have blithely continued to operate them while giving Dr Gopalakrishnan the boot The following story from Japan is another reminder that old reactors don t just fade away

On 26 November 1996. during a regular inspection at Tokyo Electric s Fukushima reactor (BWR. 460MW. 1971). inspectors discovered cracks in the pipe inside the reactor pressure vessel. Having been in operation for years, the cracks are perhaps a manifestation of the reactors age

The cracks appeared near the welds in two neighbouring pipes that earn coolant from the pressure vessel jet pump, and it appears that the direct cause was stress corrosion In all. five cracks of lengths varying from 2 to 19 cm were discovered in almost identical places on the pipes. very close to the inside wall of the pressure vessel

TEPCO (Tokyo Electric Power Company) has decided to deal with the cracks by simply clamping on steel supports and bolts and not by replacing the pipes. This is. however, obviously a stopgap measure providing no long-term guarantee of safety The clamped pipes could rupture at any moment.

Difficulty of Repairs

The pipes are located below the area between the nuclear fuel core and the pressure vessel An area that is very confined and highly radioactive There are limits to the possibility of repair work by remote controlled robots because of the difficulty of working in such a tight space, and the difficulty of controlling robots in a high radioactive environment. Thus, the replacement of these pipes will pose not only technical difficulties, but will also entail a lot of work involving heavy radiation exposure to labourers.

If the in-core piping is replaced in Fukushima 1-1, it will be the first time such work has been carried out. meaning the job have to be done without any technical corroboration whatsoever. Since these pipes were not designed or installed under the assumption that they might one day be replaced, the task is likely to be a very difficult one.

Naturally, other reactors with piping made of the same material should be shut down and inspected, but new problems could conceivably crop up, even where corrosion-resistant materials have been used. Nucleocrats must henceforth anticipate such age-related problems in all nuclear power stations.

Replacing entire BWR shroud

The Nuclear Power Engineering Corporation and Hitachi, Ltd. are developing technologies to enable replacement of in-core structures in boiling water reactors in order to keep ageing reactors on-line. This is part of the "Nuclear Power Plant Maintenance Technology Reliability Demonstration Tests" commissioned by the Agency of Natural Resource and Energy (ANRE). Currently they are running tests on replacing guide tubes for neutron flux measurement instrument. They are planing subsequent tests for replacement of core shrouds, control guide tubes, and jet pump riser braces.

In addition, we have received information that Toshiba has placed an order with a British company for three units of a large remote-controlled machine to be used in the replacement and the installation of shrouds. According to the information source, the replacement work may soon be carried out for a number of older Japanese BWRs.

Replacing a whole shroud- a large in- core cylindrical steel structure surrounding the BWR fuel assemblies- would no doubt be a job of considerable scale.

Replacing PWR steam generators is also a major construction job that entails making a large opening in the reactor containment.

Replacing, a shroud would be an even big   because it should be performered fight inside the pressure vessel. This would require opening the pressure vessel cover, taking out all components including the steam dryer, lattice, and fuel assembly, loosening and extracting the shroud, then inserting the new shroud, and finally performing the welding and other tasks inside the core. Although workers would probably be shielded by lead plates set up around the inside core wall, they would still be exposed to extremely high radiation levels.

Critically Ageing Reactors and Their Decommissioning

There arc no distinct criteria for the operation of aged reactors or for making decisions on when they should be decommissioned. We therefore have a strange situation in which development of the technology proceeds without consideration of how to handle old facilities.

Assessing the state of nuclear power plants should at the very least be done in a disinterested manner, instead of according to arrangements |ke the "regular safety reviews" that are internally managed by the utitities themselves.

The problems occurring in aged nuclear power plants are of kind that are hard to discover during regular inspections, or which such inspections are not even meant to find. To property asses the degree of ageing, there should be a requirement for an overhaul-like inspection in which plant after, for example, 10 or 20 years of operation is shut down for two or three years. It could perhaps be mandatory at that point to declare the plant decommissioned if it cannot satisfy certain criteria, the formulation of which would of course be another problem.

Source: Nuke Info Tokyo

Subscription Information

Rs.30 per year (6 issues within India)
US 115 per year or equivalent for overseas.
Rs.500 for life (only within India)
Demand drafts should be drawn on the State Bank of India. Valod (Code: 0531) For cheques and drafts of other banks, add Rs 10
Subscriptions, donations and enquiries regarding circulation should be addressed to;

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Published by S.Godekar for Saapoorna Kranti Vidyataya
a*nd* prirted by his at The Parijat Printry. Ahamdabad.
Date of Printing. April 30. 1997

ANUMUKTI
A Journal Devoted to Non-Nuclear India

Anumukti: Volume 10, Number 2

October / November 1996

Shoulders

A man *crosses the street* in rain,
stepping gently, looking two *times north and south,*
because his son is *asleep on his shoulder.*

No car must splash him.
No car drive too near to hit shadow.

This man *carries the world's sensitive carqo*
but he's not marked
Nowhere does his jacked say FRAGILE,
HANDLE WITH CARE.

His car fills up with breathing.
He hears *the hum of a* boy's dream
deep inside him.

were not joing to be able
to live in this world
if we're not willing to do what he's doing
with one another.

The road will *only be wide.*
The rain will never *stop falling.*

Naomi Shihab Nye
Atomic Ghost: Poets Respond to the Nuclear Age.

Indian Courts Need to be Educated on Nuclear Issues

The rejection by a division bench of the Bombay High Court of two writ petitions demanding public information on violation of safety regulations at various nuclear installations again highlights the fact that it is necessary to educate the courts before rushing in with petitions demanding justice.

The petitioners in the present case relied on an interview published in Times of India of former chairman of the Atomic Energy Regulatory Board, A. Gopalakrishnan who had referred to 130 violations in nuclear installations in the country.

The affidavit filed by the authorities, submitted that records of the DAE were privileged communications and were always classified as secret. Additional Solicitor General R A Dada also produced a memorandum constituting a review committee to investigate the present regulatory procedure, He said that the committee will submit its report in four months.

Chief justice M B Shah and Mr. Justice F I Rebello held that as a competent body had already been constituted to look into the matter, the court need not intervene. The petitioners had urged that DAE should disclose the report listing the safety violations.

One of the petitions submitted, "Various reports in the media have highlighted that safety measures at the installations, research facilities and power plants were not up to the mark, resulting in serious defects and accidents that endanger lives of employees, innocent citizens and all life forms," It further urged that citizens had a fundamental right to know about their safety. Counsel for the petitioners M A Rane said the claim to serrecy amounted to denial of the citizen's right to know matters which affected their lives.

This is not the first time that courts in India have given unfavourable verdicts on nuclear issues. The same thing happened in the Chernobyl Irish butter case in 1987, While the Supreme Court's verdict in the Kaiga site selection case was favourable, it did not force the atomic establishment to change its course. Therefore, there is a need that these verdicts be properly analysed to find out why judges in India are so hesitant to discipline errant nucleocrats. Is it the mystique attached to the bomb and all matters nuclear that has made the judges so diffident? They don't seem to have the same diffidence towards other technical personnel, dam building engineers for example. Education of judges and bar associations on nuclear issues ought to be a high priority for the antinukes in India.

Based on a report in Times of India 2.2. '9?

From the Editor's

Devaluation of Public Morals

There was a time when our leaders were people whose words, though not law, did carry weight. You could believe them. Honesty and probity in public life were considered virtues. Unfortunately, nowadays an honest public servant is a rarity. The very term "public servant" is an anachronism.

The most shocking revelation in recent days have not been the antics of Laloo Yadav but those of Inder Gujaral when he declared that the country possessed a stock of chemical weapons which would now be dismantled in view of our commitments under the chemical weapon's convention. It has been our oft-stated policy that chemical weapons shall be no part of our armoury since they are weapons of mass terror. As the admission by Mr. Gujaral clearly indicates, we have been saying one thing while doing the opposite and clandestinely making and stockpiling these heinous weapons. The fact that other nations (read Pakistan) have been doing the same is no justification for our own indefensible moral lapse.

Not only has the revelation not shocked the press, but it has instead been greeted by relief that Indian leaders despite all their preoccupation with sticking to their seats, do sometimes think about the security of the country! A hope has also been expressed in some sections of the press that similar will be our situation with respect to nuclear weapons and despite all our pronouncements we have been secretly building a stockpile of these as well. Nothing could be more bizarre!

If we want to be a nuclear weapon's power, let us by all means democratically decide to do so, but then do so boldly and openly so that the costs of so doing are well understood by all. To do so clandestinely is the worst of all possible worlds. Firstly, the so called benefits remain hidden. Secondly, the horrendous costs not only in monetary terms but more importantly in people's health also remain hidden. An uncaring elite will just not listen to the people who have to pay the price for these delusions of big power grandeur. The worst consequence of back-room decision making is that the people's cynicism regarding their leaders, gets deepened—a sure recipe for dictatorship.

Environmental Racism: A Landmark knoldgement

Eight years ago, a group of international nuclear promoters got together and hatched a newscheme One thing admirable about these guys, they are certainly industrious and persistent. At the time the state of Louisiana in the deep South of USA had a staunch pro-nuclear personality J. Benner *Johnson as its senator. Having been in the senate for a long time Johnson had become extremely powerful He was the head of the Senate energy committee which decided on legislation on energy related topics. The promoters were Eurenco—the European uranium enrichment consortium. Duke Power, Northern States Power Fluor Daniel and to a small extent Louisiana Power and Light The first thing they did was to form subsidiaries which together floated a company by the name of Louisiana Energy Services with the express purpose of building and operating a uranium enrichment plant at a site in Claiborne Parish near Homer in Northern Louisiana, The main purpose of doing things in this roundabout way was to protect the promoters from any financial liability due to environmental damage caused by the project.*

The site chosen was very close to two poor black communities. This too is a world wide phenomena. Any facility with health impacts gets built in poor communities who are then told how this wonderful new project is going to make an enormous difference to their benighted lives. All this is true, the project does make a great difference though not in the way it had been previously projected but in an entirely negative manner Unfortunately for the promoters, this game has been going cm for too long. Now a days, the poor instead of being properly grateful for this uncalled for generosity are downright suspicious. They organise and fight. The following is an account of a mulirai lai coalition, Citizens Against Nuclear Trash (CANT) of communities in Homer who got together and beat powerful nuclear interest and in the process have opened a new legal pathway for other similarly placed communities to follow.

TThe nearly eight-year struggle against the proposed uranium enrichment plant of the US Louisiana Energy Services (LES) is at an end. Light years of hearings, demonstrations, organising, meetings, and ongoing and unusual solidarity and support among the multiracial members of Citizens Against Nuclear Trash (CANT) in northern Louisiana have paid off

On May 2 nuclear Regulatory Commissions Atomic Safety and Licensing Board (ASLB) released its final decision on the proposed LES project. The unheard-of verdict; license denied. The ASLB reached its precedent-setting decision on the final, and critical, environmental justice contention. Earlier, the ASLB had ruled in favour of CANT that the LES consortium was not financially qualified to build and operate the plant, and was essentially a shell corporation apparently intended primarily to avoid potential liability for its parent companies. And the ASLB had ruled that LES had underestimated its likely decommissioning costs by about 50% — enough that it's already dubious profit projections were shaken But the final decision denies outright LES a construction permit/operating licence Unless LES can successfully appeal this decision to the NRC commissioners, which appears highly unlikely, it is all over.

LES will become the first entity in the US to which the NRC ever has denied a license, for any reason. CANT and its attorneys, Washington lawyer Diane Curran and Nathalie Walker of the Sierra Club Legal Defense Fund of New Orleans, argued that the LES project was a singular example of environmental racism, and that the NRC had not done its job to ensure that the proposed plant did not have a disproportionate impact on the local poor African-American population. Dr. Robert Bullard, a professor at Clark Atlanta University and a nationally recognised expert on environmental justice and facility siting issues, testified on behalf of CANI Bullard argued that the LES siting process clearly zeroed in on minority communities, eventually targeting a community that is nearly 98% African-American, that the citizens of the forest Grove and Center Springs communities closest to the plant would suffer a disproportionate and negative impact if the plant were built, and that the LLS violated its own site selection criteria in choosing the eventual site, which itself was evidence of environmental racism The ASLB agreed with all of these contentions

The ramifications of this decision may be impossible to overstate This is the first decision, issued by any judicial body in the US, that directly addresses the environmental justice issue, and does so in a framework thai

makes clear the responsibilities of corporations and federal agencies. madi dition, the decision spells out the responsibilities of federal agencies in complying with President Clinton's 1994 executive order on environment justice the first such detailing anywhere, By denying the LES a license, the Board underscored its commitment to environmental justice and laid the groundwork for all future nuclear siting decisions. Every NRC-licensed facility will have to comply with this decision. Moreover, as the first judicial decision on these issues, the opinion undoubtedly will be cited in other upcoming court cases. Seemingly aware of the historic nature of the decision, the ASLB stated in unusually clear terms exactly what is required of the NRC, and perhaps all federal agencies in reviewing license applications for hazardous facilities. In doing so, the ASLB also provided a clear, concise explanation of how environmental works, how it is not overt, how it is never admitted, but how it must be ferreted out because that is what the law requires. In their own words, "A thorough investigation must be performed — In other words, the Staff must lift some rocks and look under them"

It is difficult to imagine what options now lie open for LES. The consortium can, of course, appeal the decision. The ASLB denied the license "without prejudice", meaning that the LES can attempt to amend its license application to attempt to prove that its siting policy was not racist. The NRC staff would then have to conduct a "thorough investigation" to validate that. But the ASLB made clear that it believes the process was based on racial issues: The "statistical evidence very strongly suggests that racial considerations played a part in the site selection process. It does not. of course, rule out all possibility that race played no part in the selection process. Nonetheless, the Intervenor's (CANT) statistical evidence clearly indicates that the probability of this being the case is unlikely..." It would seem then that the LES's only opportunity would be to start its site selection process anew — a process that could not possibly lead to the proposed site in Claiborne Parish — and would bring the consortium, eight years later and at least US$40 million poorer, back to square one. The ASLB decision is essential reading for anyone involved in nuclear or hazardous siting issues. It is available at NIRS' web site (www.nirs.org) or by mail from NIRS at the address given below.

Source and contact: NIRS, 1424
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> *"Racial discrimination in the facility site selection process cannot be uncovered with only a cursory review of the description of that process appearing in an applicant's environmental report. If it were so easily detected, racial discrimination would not be such a persistent and enduring problem in American society. Racial discrimination is rarely if ever, admitted. Indeed, it is often rationalized under some other seemingly racially neutral guises, making it difficult to ferret out. Moreover, direct evidence of racial discrimination is seldom found....In other words, the Staff must lift some rocks and look under them."*

Bulgarians Show More Sense Than Deve Gouda and Gujarat

Nuclear energy is a costly and economically unsound proposition. However, nucleocrats with their glib talk and hiding behind un aura of scientific respectability are usually able to sweet talk their scientifically ignorant political masters. The fact that nuclear projects involve billions and can provide large commissions for people with good connections to power, also helps. One of the last acts of Shri Deve Gouda as Prime Minister was to go to Russia with Mr Gujaral in tow and sign the deal for two 1000 Megawatt VVFR type reactors. 1'he reason given for this act of folly and reported in most newspapers was that Russia was willing to provide "generous " terms of credit. It is a pity that none in the Prime Minister's large entourage questioned the motives of their Russian hosts in providing this generosity For a country which is out with a begging bowl even larger than India's, to be offering credit should cause alarm bells to ring. The new government in Bulgaria has shown a greater sense of responsibility, commissioned a study by independent and honest experts who came to the inescapable conclusion that even with generous Russian credits, nuclear power plants in this day and age are if not anything else, a prescription for economic disaster.

"Too Cheap To Meter" had once been the motto on the nuclear flag. New scholarship (see Arjun Makhijani's report "The Nuclear Power Deception) has shown that while nucleocrats were shouting this mantra from rooftops their own studies were showing unequivocally that nuclear power was

likely to be extremely costly. But helped by massive government subside nuclear power was able ta capture market share in some countries. But, the inherently costly nature of nuclear power was slow/y discovered all over the world despite the subsidies and misinformation. Instead of being too cheap to meter it turned out to be too costly to continue. The imminent deregulation of the electricity supply in the US is the proverbial last straw on the nuclear camel's back. By allowing any electric utility to sell anywhere in the country at whatever rates the market would bear, this measure encourages more efficient suppliers at least in the short term Utilities having nuclear power plants are finding that in some cases it might be cheaper to just right off the losses and build a new and more efficient gas based co-generation plant, It is expected that within the next year or two more than 10 nuclear power plants shall face retirement in the i 'S. The following two news-items are just a precursor of the times

Belene Nuclear Project Cancelled

The Belene nuclear power plant in Bulgaria is dead. This unfinished nuclear power plant was killed by a governmental decision on Mas 21 which stated that the plant was technically unsound and economically unviable.

The Russian-designed Belene plant had been the object of desire of several Western nuclear construction companies, including Westinghouse, which were hoping they could make profits on upgrading and completing the reactor with Western money. Construction was stopped in 1990 due to popular protest. Belene, the second nuclear power project in Bulgaria, had been on the anvil for many years. The reactors that were to be built in Belene are the same VVER— 1000s that have been proposed for Koodankulam. Experience with these reactors at Kozloduy did not enthuse the new government. Their capacity factors have been just 34%.

The government stated that Bulgaria cannot continue developing nuclear energy with the existing generation of reactors. "The society has to shake off the years-long illusion that nuclear energy is cost-effective and the nuclear power plants are safe." This was said with special reference to Kozloduy, Bulgaria's first nuclear power station. "The inclusion of all present and future expenses for the storage of the highly radioactive waste entails reassessment of all upgrade programmes. The work on the old reactors can be extended only if the safety upgrades are acceptable from an economic point of view."

An expert council made up of scientists, representatives of governmental energy-related institutions, energy companies and others reviewed a study done by the Russian institute "Atom- energoproekt" that was pushing for the completion of Belene and offering a credit worth USS 400 million. The expert council's decisions refuted the study and decided that the completion of Unit I of Belene is economically unjustifiable Mentioned as a first priority in the expert council's report is energy efficiency. It stated that a consistent national energy-efficiency program in the course of 20 years can save over 1500 MW and allow the closure of the four old units of Kozloduy.

Energy efficiency makes special sense in Bulgaria because their present energy use is like India's extremely inefficient. On a per capita basis Bulgarians consume 5,479 kilowatt-hours every year—about 20% more than the average in European OECD countries.

The electricity that Belene was supposed to generate was mainly meant for export. Unlike India, even with inefficient consumption patterns, Bulgaria is surplus in electricity. It already has 12.000 MW of installed capacity and its peak consumption in winter does not exceed 7,000 MW

The decision also comes al a good time for other nuclear fights in the region, where plants of similar design are being proposed for upgrade specifically the two reactors in the Ukraine (Rovno 4 and Khlemcnttsky 2) which the G-7 wish to fund to supposedly replace the operating reactors at Chernobyl So. this is great news which could reverberate in all Central and Eastern Europe!

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Yankees Getting Mothballed

The owners of the Main Yankee nuclear reactor announced on May 27. that the reactor will be permanent!) closed and mothballed The reactor has been shut down for about a year for a number of safety deficiencies The owners blame the shutdown on upcoming electricity deregulation and the uncertainty that power from Maim-Yankee would be profitable There is just a theoretical chance that the reactor will he bought by Philadelphia Elettric, but no one really believes this will happen This is the second permanent reactor shutdown in New England in less than six months Connecticut Yankee closed in early December 1096

Fire leads to Meit-down of People's confidence in Japanese Nucleocrats

Japart has aggressively pursued nuclear energy in order to ease its dependence on imported energy sources such as oil. It remains one of the few countries developing breeder technology. About 30 percent of Japan's power comes from nuclear plants.

On March 11 at 10.06 am local lime, a fire broke out at the nuclear waste disposal facility near Tokai village in Iburaki Prefecture just north of Tokyo. Japan. This fire led to an explosion about ten hours later. The blast shattered windowpanes and destroyed a hatch and a thick lead door. This door isolated the hazardous area from the areas beyond, its destruction exposed the environment to contamination.

The waste disposal facility concentrates low level liquid nuclear waste and mixes it with bitumen in a process called bituminization. The fire started in the room where barrels are filled with bituminized waste. Since the liquid waste arises from reprocessing, it contains caesium, strontium, ruthenium as well as plutonium and trans-uranic elements

Nero Fiddled!
Nucleocrats Prefer Golf

Power Reactor and Nuclear Fuel Development Company (PNC) the owners of the plant, assumed that the fire had been successfully extinguished by a manually operated sprinkler, even though the room was still full of smoke; this serious error led to the explosion 10 hours later.

Senior staff started a four-day golf tournament on the day of the accident and they continued playing both that day and the next day when it was realised the accident was much worse than initially thought. One of the staff who took part in the golf competition said they thought "it would be wrong" to cancel the game when they had reserved the golf course.

The government sought criminal charges against its own nuclear development agency because a series of accidents and coverups have angered the public and spurred doubts about the program's future.

The Science and Technology Agency filed a criminal complaint with police asking them to pursue charges against the Power Reactor and Nuclear Fuel Development Corp.,or Donen, for falsifying facts regarding the accident. Donen said in an official report to the government that someone had confirmed the fire had been put out, but no such confirmation had occurred.

Japan Atomic Energy Commission (AEC) Chairman Rllchiro Chiaoka has confirmed that Power Reactor and Nuclear Fuel Development Corp. (PNC) will be scrapped and replaced with a new organisation which will focus on fewer projects.

Donen acknowledged that several officials acted together to falsify the report, and it has demoted five of them. At least 37 workers were exposed to low doses of radiation during the plant accident, classified as Japan's worst.

For years, there seemed to be no stopping Japan's controversial programme to use highly toxic plutonium to make energy, despite mounting protests at home and abroad. The unprecedented action against state backed Donen is a sign of growing resolve in government circles to heed calls for reform. Prime Minister Ryutaro Hashimoto, speaking of Donen after the Science and Technology Agency's announcement, promised to "investigate them thoroughly and beat them into shape."

The action against Donen came a day after the government said Donen waited a full day before disclosing that an experimental reactor in Tsuruga. western Japan, was shut down because radioactive water leaked from an exhaust pipe.

Another controversial Donen project is located in Tsuruga - prototype breeder reactor intended to run on plutonium. An accident and subsequent cover-up there in December 1995 further marred Donen's reputation.

Yukio Kurita, governor of Fukui Prefecture where Tsuruga is located, told reporters that "Donen can no longer be trusted with Japanese energy policy unless it is completely overhauled."

Anger is also growing against Donen's overseers in government, something Science and Technology Agency chief Riichiro Chikaoka acknowledged during a news conference. "This is something we really have to work out very soon or else Japan's entire energy program itself could grind to a halt," he said.

Despite the action against Donen, some anti-nuclear activists say it is too early to hope for the kind of fundamental overhaul they're looking for in Japan's nuclear development program.

"I doubt that much will change." said. Hideyuki Ban of the Citizen's Nuclear information Center. "Japan's plutonium program still needs to be completely rethought."

Source: Nuke-Info Tokyo

Taiwanese Shipments of Nuclear Waste to North Korea

apioca, Taiwan's government-run power utility, signed a contract in January to ship up to 200,000 barrels of low-level waste for final storage in North Korea. Strong local opposition by the indigenous Yami people to the dumping of nuclear waste in shallow trenches on Lanyu Island, 65 kilometers off Taiwan's Southeast coast, and by five candidate communities for a new waste disposal facility on Taiwan, forced the company to search abroad. They failed in attempts to dump the waste in the Marshall Islands and Russia. North Korea, impoverished by the years of misrule by "great leader" Kim ul Sung and clan is suffering a severe famine this year and is willing to pay any price to gain hard cash. If the shipments proceed, they set a dangerous precedent: it would be the first time, anywhere, that radioactive waste is exported for final storage.

The Taiwanese export their spent raisins
Indians dump them near streams

During the survey at Rawatbhata Nuclear Power Station in Rajasthan we found coffee and white coloured bead like substances dumped near streams. On being shown pictures the then AERB chief exclaimed, "What are these spent resins doing there!"

Greenpeace announced on May 15 the discovery of major misrepresentstions in the classification of radioactive waste to be exported by the Taiwan Power Company (Taipower) to North Korea. Greenpeace spokesperson Ho Wai Chi said the discovery raises serious concerns for the safe transport and storage of the waste. "The waste is significantly more radioactive than Taipower claims," said Ho. "Taipower has misled the people of Taiwan, the international community and the governments of neighbouring countries about the dangers associated with shipping and disposing of their radioactive waste in North 'Korea."

The Greenpeace team was accompanied by John Large of Large & Associates, a British nuclear engineering firm retained by Greenpeace to do an independent evaluation of Taiwan's nuclear waste sector. The group conducted a 10-day study of the nuclear waste sector, and inspected waste facilities at the Kuo Sheng nuclear power plant and on Lanyu Island.

They discovered that (he so-called low-level radioactive waste, which Taipower plans to export to North Korea, contains ion exchange resins and filter masses, some of the most dangerous wastes produced by nuclear reactors. on exchange resins are used to strip liquid streams in the reactor primary circuit and irradiated (spent) storage fuel ponds. The resin beads or pellets concentrate a wide range of (radio) activated and fission products. In terms of (radio) activity and persistence (half-life) ion exchange resins are very active (20.1012 Bq/m3 to 200.1012 Bq/m3) and very long-lived (tens of thousands of years). The current Taiwan nuclear program will generate approximately 100-120 m3/yeir raw ion exchange waste, or about 200-290 m3 packaged per year. "The waste that Taipower chooses to call low level, and claims will not demand special handling, is actually a soup of highly radioactive poisons that requires complex technology, highly trained personnel, and a fully developed infrastructure in order to fulfil the most rudimentary safely requirements," said Large No added "By exporting their waste. Taipower is creating the potential for serious environmental consequences for North Korea Taipower must deal with its own waste, including removing it from Lanyu Island, and it must immediately cancel this dangerous and irresponsible agreement with North Korea"

Although no international agreement at present bans waste exports, the scheme is clearly in violation of the principle of the International Atomic Energy Agency (IAEA) that radioactive waste must be cared for in the country of origin unless safety of treatment is enhanced by export. The IAEA General Conference Resolution of September 20. 1996. states" Radioactive waste should, as far as compatible with the safe management of such materiaf, be disposed *of in* the State in which it was generated, whilst recognising that, in certain circumstances, safe management of radioactive waste might be fostered through voluntary agreements among Member States to use facilities in one of them for the benefit of the other States, " The principle is repeated in Point IX of the Preamble to the Draft Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The convention will be opened up for signature in September or October 1997. All countries will be able to become parties to the Convention, not only IAEA member states. The Director General of the IAEA said on May 27, in South Korea, that the planned waste Taiwan-North Korea exports will not be supervised by the IAEA: "No international organisation has supervisory rights"

Source' WISE News Communique

With the Instability of a Greek Tragedy

The Continuing Disaster at Kaiga

Tragedy makes the best theatre. We know the inevitable end and yet we watch fascinated as it unfolds. There are warnings galore of the impending disaster but the protagonists in their hubris continue on their disastrous course.

The construction of a series of nuclear reactors at Kaiga has all the makings of a Greek tragedy except one. The ancient Creeks concerned themselves with doings of heroes. The actors on the Indian nuclear stage are anything but that.

The following is taken from two news-reports which appeared in the Deccan Herald of April 22 and 24, 1997. It is said of the Bourbons of France that they forgot nothing and they learnt nothing. The Indian nuclear establishment can any day put imperial France to shame. It has not only learnt nothing but it feels that there is nothing to learn. Even lowly station directors issue statements where losses of billions of rupees are tossed away as if they were peanut shells. The chairman, doesn't feel that he has a responsibility to the public to explain the most ridiculous accident in a nuclear power plant anywhere in the world. Leave alone giving explanations to public, the establishment doesn't even think that they need to fix responsibility for an accident Which if it had occurred after the reactor had started operations would have meant a write-off of vast stretches of land and untold misery to people. Without going into the technical details of "radial tensions generated by inadequately grouted cables, (see below) one can still be amazed at a system which allows contractors and designers to summarily change plant specifications at will bypassing the whole system of multiple checks and certifications. But the most amazing fact of all is that we the people stand for all this nonsense and allow such shenanigans to take place without protest.

What is a few thousand crores here and there!

The two 220 mega-watt reactors of the Kaiga nuclear power project are likely to be commissioned during 1998-99, slated ils Director V K Sharma.

Speaking to Deccan Herald, he said the cost of the two units was estimated to touch Rs.2.275 crore. This massive hike in cost, from the original estimate of Rs.774 crore in 1984, had resulted from the collapse of one of the reactor domes three years ago, rupee devaluation and price escalation.

Work on these two units of the six-reactor project com ing up on the banks of the Kali river, to the east of Karwar, "is progressing at an even pace with only some mechanical and civil constructions pending"

Mr Sharma said that because of the delay in commissioning the reactors, an annual interest burden of Rs.150 crore had to be borne. The two units were initially scheduled for completion in 1995.

Trust me!

Look at my excellent record

The reactor dome failed because of its inability to withstand radial tension generated due to pre-stressing of cables, which were inadequately grouted, Mr Sharma said. Affirming that the design was weak and faulty, he said new specifications • such as increasing the dome thickness by 110 mm and changing the concrete grade from M45 to M60 - had been incorporated.

Similarly, the placement of cables had been made less congested, radial reinforcement added and quality control on construction tightened. However, Mr Sharma revealed that other than these specifications, the overall design had not been changed.

Those not responsible have been punished adequately

Nor had the designer and contractor been replaced, even though the contractor had been found to have deviated from the specifications "with the consent of the designer". Describing the dome failure as an error in judgement, Mr Sharma said only some of the personnel involved in the project had been shifted out.

Following the incident, two inquiry committees set up by the Atomic Energy Regulatory Board and the Nuclear Power Corporation of India Limited probed the causes of the dome's collapse. These bodies, though differing on the exact cause of failure, have listed certain deficiencies in design and execution but have not fixed responsibility on any party. Given the interest burden, it is more important to speedily reconstruct the dome. Mr Sharma felt.

The Kaiga project, situated amidst verdant hills barely 20 km from Goa's southern border, has raised apprehensions about the effects of an accidental radioactive fall-out from the uranium-based plant on human health and environment, among the surrounding population particularly after the dome failure.

Responding to these fears, Mr Sharma asserted that nuclear power was benign and ecologically safe. The only two nuclear accidents that occurred in the world, at Chernobyl in the erstwhile USSR and Three Mile Island in the United States, were due to technical faults.

But for its own weight, the reactor can withstand anything and anyway radiation is good for you!

He said the Kaiga plant was designed to withstand natural calamities like cyclones, seismic tremors and flooding. Besides, it allowed for double containment of radioactive leakage, a 3.2 km exclusion zone which was more than the globally adopted limit. Moreover, a recent World Health Organisation study had ruled out that radiation caused cancer, he said.

Public Accountability? Never Heard of it!

A high-power parliamentary panel has asked the Department of Atomic Energy (DAE) to clarify whether the Kaiga nuclear plant unit-1 received the Atomic Energy Regulatory Board's (AERB) approval.

According to a recent report of the parliamentary standing committee on energy, the action taken on the report submitted by the department did not clearly mention whether it had got the nod of the board for the revised design of inner container (IC) dome of the Kaiga unit-1.

The IC dome had collapsed two years ago delaying the execution of many other on-going projects, including Kaiga-2. While the DAE apprised the committee that the revised designs for the Kaiga-2 and the Rajasthan Atomic Power Plant units 3 and 4 had been approved by the AERB, there was no mention about the Kaiga-1. the report said.

The 44-member committee also wanted to know the clearance given by the board to all the units, including the design of the supporting structure required for casting the dome as well. It urged the department to inform it of the progress of all the units in the pipeline from time to time.

Oliver Twist resides at Anushakti Bhuvan

The committee, headed by former Jammu and Kashmir Governor and Lok Sabha member Jagmohan. expressed serious concern over the department's inability to utilise all the budgeted funds during the Eighth Plan period. The shortfall, according to the report, had been due to the DAE's inability to mobilise enough internal and extra-budgetary resources.

The department apprised the committee of its efforts to seek an enhancement in net budgetary support by Rs.330 crore and a corresponding reduction in IEBR for the current year plan. The DAE has also requested the Union Finance Ministry and the Planning Commission to substantially step up the equity support of the Nuclear Power Corporation (NPC) from the present Rs.345 crore to Rs.1,000 crore and is currently awaiting their reply.
Source: Based on two items in Deccan Herald

A Voice From Within

Opposition to Science Based Stockpile Stowardship Programme

The US like other nuclear weapons powers is poised on the horns of a dilemma. On the one hand they already have too many nuclear weapons. Thousands of them, in fact. They realise that they, or any body else for that matter does not 'need' so many. On the other hand, years of nuclear weapons production has created a strong lobby which has known nothing else and wants to continue doing the same.

A world where nuclear weapons constitute the currency of power is an inherently extremely unstable world Countries which do not already have these weapons but have notions of their 'rightful' place in the world, hanker after them in (he hope that possession of nuclear weapons will confer on them the status of a 'big' power. Countries which already have the weapons feel like passengers in third class compartment that no new member can be allowed to join the already overcrowded 'club'

In this cauldron of dubious motives are the vast majority of ordinary folk People like you and me. who realise that these weapons are unhealthy for them, their children and other living beings. They want a world free of nuclear weapons and in these democratic times they need to be propitiated by at least some semblance of effort towards elimination. How to keep (he people satitfied while at the same time maintaining super power status and control is the dilemma.

Bill Clinton's solution to this has been ingenious. Freeze is the key word here. Freeze everybody where they are on the nuclear learning curve. No new teats and no new military fissile materials production. With all the world congealed at the current level, the status-quo as regards power is also frozen solid and besides you earn the gratitude of millions for having the vision to take the world away from the dangerous nuclear course!

Like always there is a fly in the ointment. Two flies actually .One is India with Pakistan in tow. Being used to third class travel for ages, they know that create enough of a nuisance and you are bound to get accommodated.. But the other fly are the weaponeers in the nuclear weapons states themselves. They are loath to give up a lifetime's lucrative and stimulating occupation, just so that the world could be a safer place to live in and unlike India, these guys have clout.

To give his grand design a chance, Bill Clinton capitulated before the weaponeers. To get their support or rather to prevent their active opposition to the Comprehensive Test Ban Treaty, he bribed them and Clinton is in a position to give far more than a King's ransom! The result has been a $40 billion giveaway called the Science Based Stewardship Program. All kinds of new gadgetry and facilities where new physics can be learnt without carrying out the tests with their unpopular fallout, so that new exotic weapons can continue to be made and the world made ever safer for democracy and the American way of life.

This tale ought to end here with everybody but the villain (India) happy. But, this time there is a new fly in the ointment!

Writing in Nature, Ray Kidder, now retired, but who worked on weapons at the Lawrence Livermore National Laboratory for 35 years, says that government plans to "manage" the nuclear warhead stockpile won't work. It could, he argues "be maintained certifiably reliable and safe for decades (or even centuries) by continuing the assiduous and perceptive surveillance that has been practised for many years."

The government argument is that they will have to continue basic warhead research simply as a matter of national and international security, and they will have to understand what is happening to the existing stockpiles just to keep them safe and they will have to keep up teams who know how to make bombs because these are also the people who know how to dismantle them as they become dangerous.

The US is dismantling warheads at the rate of about 1,800 a year; it has stores of about 8,000 lumps of plutonium already removed from the weapons stockpile by the remaining arsenal is still vast, and likely to stay so for decades. The fissile plutonium in the warheads remains a potential target for terrorist theft but is otherwise safe; the metal casings, however and the high-explosive triggers and plastic components are likely to deteriorate with age. The US Department of Energy has announced a 10-year, $4bn a year programme to make changes in both the material in warhead, and the designs.

This is what upsets Kidder. He argues that it would be perfectly safe simply to "remanufacture" an already tested weapon: there is no need to change the material in it or the design. As Kidder sees it, the government expects that "expertise" can be maintained only if scientists are kept busy continuously modifying weapons, and improving the physics involved in their destructive power. They will do this by "zero-yield" testing explosions that won't actually cause a self-sustaining nuclear chain reaction and they are proposing to do this 1000ft underground at the Nevada test site, deep enough to conceal a real test of nuclear warhead.

Activists disrupt nucleer ceremony

On 29 May, US anti-nuclear activists staged protests at the Lawrence Livermore nuclear weapons laboratory in California, during a "groundbreaking" ceremony presided over by US Energy Secretary Federico Pena.

The ceremony was to mark the start of construction of the National Ignition Facility (NIF). It included a video on two giant TV screens of the face of Edward Teller, "father of the H-bomb". When this appeared, ten demonstrators within the grounds revealed T-shirts bearing the slogan: "Nuclear insanity for ever" and stood in silence holding hands in front of the official "ground-breaking" site.

Meanwhile more than 200 people outside the fence sang, chanted and displayed slogans. Thirty-five were arrested at the Visitor's Gate as they tried to serve the lab with an "Order to cease and desist from illegal activities" (...such as the NIF). Local police did not accept their claim that Lawrence Livermore was breaking the law by ignoring the World Court ruling that "there exists an obligation to pursue in good faith and bring to a conclusion negotiations on nuclear disarmament in all its aspects..."

He thinks that all the weappns laboratories need to do is remanufacture new warhead as old ones deteriorate. That would not be misunderstood. An attempt to try new, however, could be interpreted as a step towards "novel" weapons. And, he says, it is no good the Department of Energy suggesting that remanufactured weapons would not be reliable.

Since 1972, there have been 17 "stockpile confidence tests". One of the warhead tested was nearly 30 years old. In all but one of those tests, neither the age of the weapon not the way it had been put together made any difference to the outcome. A result like that Would not have been possible if the designers had not done the job properly in the first place.

Space Probe Explodes, Plutonium Missing

It was brighter than the brightest star, said John Van der Brink, and had tail about 12 times the width of the full moon with "sparkling bits sort of coming off the back of it. This was an extraordinarily spectacular event."

From his vantage point in the mountains of northern Chile where he and his wife had gone to watch meteors, he had "no illusions that it was anything other than a piece of space debris" falling to Earth through the ink black night sky. Van der Brink recently retired as an electronics specialist from the European Southern Observatory in Chile.

Leo Alvarado, a postgraduate student of geology from Chile's Universidad Catholica del Norte, who had been driving with four colleagues across the Atacama Desert in northern Chile, saw it too, changing brilliant colours as it came down. 'We watched it break up into many pieces and burn," he recounted.

What they and other eyewitnesses saw last November 16 was Russia's Mars 96 space probe descending along a swath of Chile and Bolivia and scattering its remains across a 10,000 square mile area. The probe carried about a half pound of deadly plutonium divided into four battery canisters that were to serve as electricity sources for Mars rovers. Like their US counterparts, the containers were touted as sufficiently strong and heat resistant to remain intact, no matter what. The US is now admitting that may not have been the case.

"Named after Pluto, god of the underworld, (plutonium) is so toxic that lest than one-millionth of a gram, an invisible particle, is a carcinogenic dose," emphasised Dr. Helen Caldicott, president emeritus of Physicians for Social Responsibility. If the probe "burned up and formed fine plutonium oxide particles...there would be an increased hazard of lung cancer," commented Dr. John Gofman, professor emeritus of radiological physics at the University of California at Berkeley, who investigated the 1964 crash back earth of a US SNAP-94 (System for Nuclear Auxiliary Power). When its plutonium-fuelled space power system burned up in the atmosphere. 2.1 pounds of plutonium vaporised and dispersed worldwide. Dr. Gofman has long linked that accident with an increased level of lung cancer.

What Me Worry!

"There are two possibilities." says Gorden Bendick, director of legislative affairs of the National Security Council, about the fate of the canisters. "One, they were destroyed coming through the atmosphere (and the plutonium dispersed]. Two, they survived and impacted the earth and drove through penetrating the surface ... or could have hit rock and bounced off like an agate marble. ...I don't give any credence for any one (possibility] because I don't know."

"If the canisters burned up in the atmosphere, bottom line here, if they weren't heat resistant enough to stand what I would call a nonstandard reentry pattern, the release was may be up to 200 grams of plutonium. which is like a drop of blood in the Pacific Ocean. There is no environmental problem with a couple of hundred grams. ...If in fact this thing survived re-entry into the atmosphere and these things came down and crash impacted on the Earth — they were meant to penetrate the Mars, their original target — they'll never be found. And even if they did and were found, people could walk around with them in their pants pockets for the rest of their lives and *never* be bothered. ...If it became paniculate matter after diffusing in the atmosphere, burned plutonium would be much similar to open air testing that the French did in the Pacific as recently as a few years ago Nor was that possibility dangerous, since 'we can find no positive casual link between radioactivity released in atomic bomb testing done by the US in Utah, for example, and cancer."

Such serenity did not always reign When the US Space Command announced on November 17. 1996. that the wayward Russian probe "will reenter the Earth's atmosphere ... with a predicted impact point ... in east-central Australia" in a matter of hours. President Bill Clinton telephoned Australian Prime Minister John Howard He offered the "assets we have in the Department of Energy" to deal with any radioactive contamination (Clinton was planning to fly for a stale visit, the first stop before an Asia tour)

The Australian military and government were placed on full alert The US television networks all featured stories on their Sunday evening news programs Some people "hit the panic button when President Clinton rang the Prime Minister," reported the *Irish Times* from Adelaide: A "national crisis" had been "sparked by this interplanetary ballistic bungle." Others hit the bottle: "A barkeeper *in* the tiny outback town of Tibooburra offered his customers free beer after officials announced the probe might land in a nearly swamp. A bookmaker in central Australia's Alice Springs said doz.-ens of gamblers tried to place bets on where the Russian probe would crash."

Masters of the Idle Boast

"Masters of Space" is the motto of US Air Force Command (US SPACE COM) — The arm of the U S Air Force charged with space warfare and tracking man-made objects in space. They made a series of spectacular blunders Though November 17, the day *after* the Mars 96 space probe had already fallen on South America, the Space Command remained focused down under.

On November 17, the Space command made a prediction: The probe would fall not on Australia, but to the east, in the Pacific. "Mars '96 probe landed in the water," heralded *USA Today.* "That means the radioactive batteries in its lander vehicles with their ...ounces of potentially lethal plutonium, lie at the bottom of the ocean."

Prime Minister Howard went before Australia's House of Representatives: "It does appear that what we all have is a happy ending to the saga of the Russian spacecraft." The *Washington Post* ran the headlines: "Errant Russian Spacecraft Crashes Harmlessly After Scaring Australia."

They were all wrong. On November 29, It days later, the US Space Command completely revised its account: "We now believe the object that re-entered on November 17, which we first thought to be the Mars 96 probe, was in fact the fourth stage of the booster rocket, rather than the probe itself and the batteries.

Racism and Spacism

But the problem went beyond simple technical incompetence. "You can clearly see the double standard," charged Houston aerospace engineer James Oberg., "Australia got a phone call from the President, and Chile got a two-week-old fax from somebody. Are the lives of Australians worth more than the lives of Chileans?"

Months later, the fate of the probe and the plutonium it carried remains unclear. The US, which gave a presidential-level pledge of "assets" to Australia to deal with any radioactive contamination when it looked like the probe was falling on Australia, was not providing any assistance to Chile or Bolivia. Dr. Luis Barrera, an astrophysicist and director of the Astronomy Institute at the Universidad Catolica del Norte, said that NASA officials had e-mailed him thanking him for gathering eyewitness accounts of the probe's disintegration. Then the agency's interest subsided. He suspects NASA doesn't want too much attention paid to this event because bad publicity might impact on NASA's already controversial plan to launch a reco 1723 pounds of plutonium on its Cassihi probe scheduled for October. The Russian government has been "uncooperative," said Barrera, still not giving Chile a description of the canisters so that searchers would know to look for -if the batteries remained intact.

The US news media were similarly blase about the implications for Latin America. The *New York Times* relegated the story to a five-paragraph Reuters dispatch under "World News Briefs" buried inside its December 14 edition.

As to why the US was not providing the "assets we have in the Department of Energy" that Clinton promised Australia? According to Bendick at the NSC, "It's not the United State's responsibility to protect the world from this.... We told Bolivia and Chile that we would provide technical assistance, but they haven't requested any. They asked for technical data and we provided information on the radioactive combination of the air, the ground and the water, and we said it is negligible."

There did not, however, seem to be any hard evidence for that optimistic assessment. In January, the Chilean government asked its ministers of Defence and Interior and the Chilean Nuclear Energy Commission to conduct a study "to determine with absolute certainly if there was radioactive contamination. There is concern because the water source for several cities is in the impact region.

Accidents Happen

While the Mars 96 accident reminds us all that not only *can* accidents happen, but they do happen with disturbing regularity.

Bringing that message home in a spectacular way on January 17 there was an explosion of a Delta 11 rocket lofting a $40 million US Air Force navigational satellite. The 12-story, $55 million rocket blew up 13 seconds after launch. As the burning fragments descended over a wide area, a cloud of toxic chemicals formed above the site and began drifting out to sea. then back to land and then south along Florida's Atlantic Coast. It contained nitrogen tetroxide and monomethylhydrazine, components of the rocket's fuel - both described by NASA documents as "deadly if a person comes into contact" with them. Residents as far as Vero Beach, 100 miles away, were told by the Cape Canaveral officials to stay inside, close all windows and doors, and turn off air conditioning and heating units. At the Cape Canaveral Elementary School, Brad Smith, a fourth • and fifth-grade teacher, described the cloud as having "weird purples and blues and reds." He said he pushed wet paper towels under the door to his classroom to keep the rocket fumes away from his students.

The accident occurred just where a Titan IV rocket is scheduled in October to launch the Cassini probe that will be carrying 72.3 pounds of plutonium. Flight failures are fairly routine and any claims that there is no real danger from Cassini is false. Nuclear cargo is a setup for catastrophe.

Dispersing Danger

Whether or not Cassini explodes or is even launched, its use of radioactive material has already done damage. In July 1996, Los Alamos National Laboratory reported increased contamination of workers and equipment and cited work on Cassini's plutonium-fuelled systems as the primary cause.

Plutonium, stresses Greg Mello of the Los Alamos Study Group, is inherently dangerous to work with and "increased work with plutonium will cause increases in worker exposure."

If the Cassini mission goes forward, many more people could be impacted. The initial danger is that a blow-up on launch could break open or melt the plutonium-carrying canisters and spread radioactivity. The second potential flashpoint is the "slingshot manoeuvre" planned for 1999. In this "flyby" scheme, 22 months after launch, NASA will swing Cassini back towards Earth in order to use the planet's gravitational force to gain enough velocity to propel the probe on to Saturn, its final destination. During that Passover. Cassini is to fly just'312 miles above the Earth's surface. But if there is a miscalculation or malfunction and it comes in too close and undergoes what NASA calls an "inadvertent re-entry." it could burn up upon hitting the 75-mile high atmosphere, spreading plutonium over a wide area.

NASA PR material gives the impression that even then, the plutonium would not be dispersed as cancer-causing vapour and respirable particles. But. in fact, the space agency's *Final Environmental Impact Statement for the Cassini Mission* totally contradicts that, saying, if the Cassini probe dips into the Earth's atmosphere during the "flyby," a sizeable portion of the plutonium fuel should be released, including much of its as "vapour or respirable particles.

The NASA Final Environmental Impact Statement for the Cassini Mission also says that if there is such an "inadvertent re-entry" during the planned Earth "flyby" of Cassini on August 16,1999. and the probe breaks up dispersing plutonium, "approximately five billion of the estimated seven to eight billion world population...could receive 99 percent or more of the radiation exposure." '

Despite the danger signs with which Mars 96 and Delta II lit the sky, the Clinton administration is pushing ahead not only with Cassini, but with other nukes in space. In September, the administration announced a national space policy that includes the development of nuclear-propelled rockets for military and civilian uses. The Defence Special Weapons Agency will work on "multiple nuclear propulsion concepts" for military missions, while NASA's Mar-shall Space Flight Center's Advanced Concepts Division, along with Los Alamos National Laboratory, will develop nuclear propulsion for civilian uses.

Despite the danger signs, the Clinton administration is trying to populate

Meanwhile, at the 14th Symposium of Space Nuclear Power and Propulsion in Albuquerque in January, scientists from Brookhaven National Laboratory recycled a plan to rocket high-level nuclear waste into space. The US government had proposed this same scheme decades ago, but rejected it out *of* fear that an accident on launch or a fall back to Earth would douse the planet with atomic waste.

US acknowledgement that radiation may well have been released over Chile and Bolivia when the Mars probe nosedived back to Earth is tacit admission that safety systems are not foolproof.

Says John Pike, director of the Space Policy Project of the Federation of American Scientists: "If you liked Mars '96 you'll love Cassini."

Karl Grossman

It is a Small World

SELLAFIELD CAESIUM FOUND IN ARCTIC OCEAN

New figures show that caesium contamination from the Sellafield reprocessing plant in UK has reached Canadian waters. The contamination, which has never been detected so far north, is having a bigger impact on the Arctic than the Chernobyl accident, according to new Canadian data Iodine- 129 from Sellafield has shown up beyond Siberia to the north- western shores of Canada at a depth of 200 meters the radio. activity is 10times greater than the background level from nuclear weapons fallout It is estimated that Sellafield has released 40.000 billion Becquerels of cacsium-137 So far. about 15.000 billion becquerels of this have reached the Arctic. That is between two and three times more than the contamination from Chernobyl in the same ocean. The largest discharges from Sellafield up to now were in the late 1970s and early 1980s, with peaks in 1975, 1977 and 1980. The same peaks showed up four years later in the Barents Sea. North of Norway the radioactive plume splits itself in two Part of it goes along the Siberian coast and crosses the North pole towards the

Canadian coast, another passes north of Iceland via the south coast of Greenland to the Canadian coast The research was led by the Bedfors Institute of Oceanography in Halifax, Scotland.

Source New Scientist. 10 May 1997

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All is Just Not Kushaal at Khushab

U.S. officials last week categorically denied a report from Pakistan which claimed that an unsafeguarded reactor near Khushab has started operating. One official monitoring nuclear developments in Pakistan told *Nucleonics Week* instead that "all the data at hand indicates that the reactor is still cold."

Two weeks ago, the Pakistan English-language newspaper *Dawn* asserted that the reactor is finished and has started up, but cannot produce electricity or reach full power because of a shortage of heavy water

Western officials conjectured that the Pakistan claim may have been triggered by a construction milestone at the reactor site or planned in response to recent reports that India has deployed the Prithvi ballistic missile.

In 1994, Western officials had claimed that Pakistan was building a plutonium production reactor, rated at between SO and 70 megawatts thermal, at a site near Khushab. These sources later added that intelligence pointed to construction of a fuel fabrication or reprocessing centre near the reactor As late as this April, however, a member of the Pakistan Atomic Energy Commission denied flatly that the reactor existed.

According to one U.S. official this week, however, the Khushab reactor "is definitely out there" but not scheduled to be finished "until later this year or sometime in 1998." Another official said that, under the most optimistic schedule, completion of the reactor "is several months away." Sources indicated that the reactor had not yet undergone cold testing, let alone become critical.

The Pakistani report suggested that the reactor would be used for electricity production as well as for isotope production. Recent surveillance photograph of the site, however, do not indicate, that Pakistan is building power grid infrastructure, such as turbine generat of equipment, for electricity generation over, Western officials said, it is not believed that reactor's chief purpose is isotope or silica production, as stated in the Pakistani account. Pakistan has a technical co-operation program with the IAEA for these activities, "but none of this has got anything to do with Khushab," one Vienna official said, and the IAEA "has not been informed" by Pakistan that the reactor is under construction or that Pakistan plans to incorporate the unit into its existing technical co-operation program.

Sources said that, because Pakistan is facing a massive financial crisis, the U.S. and other creditor countries supporting the International Monetary Fund are trying to leverage Islamabad to keep the reactor from operating outside of IAEA safeguard. Dr. Zia Mian, a research fellow at the Union of Concerned Scientists in Cambridge. Mass observed, "If Pakistan were to start operating the reactor now, it would be taking a very major foreign policy step," demonstrating to the world that its unsafeguarded program is going forward regardless of U.S. opposition, and escalating military nuclear activities to include significant plutonium production.

Indian Report Also Unconfirmed

U.S. officials last week confirmed the assertion by *Dawn* that a critical factor which may indefinitely delay full-power operation of Khushab is shortage of heavy water. But they did not confirm recurring Indian reports that China, which the U.S. believes to have supported construction of Khushab. also provided heavy water for it. According to Western intelligence sources, a full inventory of heavy water for the unit would be about 15-17-metric tons (MT), though it could go critical with a smaller amount.

Indian sources said that, in 1996. China sold Pakistan 40 MT for Khushab. U.S. officials said the Indian government had told Washington this recently, but U.S. government agencies "could not confirm" the Indian assertion. A U.S. officials said last week that, when New Delhi made the allegations to Washington, the U.S. "went back to the Chinese on this" and received assurance from Beijing that Chinese entities did not sell heavy water to Pakistan for Khushab.

According to the Pakistani report, administrative difficulties in Pakistan had prevented heavy water from being allocated for the Khushab reactor. Sources said that, in fact, most of Pakistan's scarce heavy water resources have, over the last two years, been allocated for the Karachi Nuclear Power Plant (KANUPP). which requires massive quantities of heavy water but which is also safeguarded. That allocation, sources said, reflected a general policy by Pakistan under former prime minister Benazir Bhutto not to take any step, such as producing high-enriched uranium (HEU) at the Kahuta centrifuge enrichment plant, which would be seen by Washington as provocative and escalating regional nuclear tension. One source said, "Keeping heavy water at Kanupp and away from Khushab should be seen by Washington as going hand-in-hand with not enriching uranium to HEU."

— Mark Hibbs. Bonn
Nucleonics Week— July 3. 1997.

• The Peripatetic Editor Goes Globe-Trotting

W'hen the cat is away the mice will play is an old saying. The *Anumukti* team is of course no cat and mouse operation, but still, when the editor goes globe-trotting, the regular production of the journal does suffer. This year, while the monsoons seems to have taken a break in Vedchhi. invitations for visits to distant lands have started pouring cats and dogs and being a self-indulgent sort. I have been unable to say no.

For five weeks during April and May. I went to U.S.A. at the invitation of Institute for Energy and Environmental Research in Washington. The purpose was to present an Indian NGO view at the preparatory meeting of the Nuclear Non-Proliferation Treaty (NPT) at the UN in New York. And at the beginning of May. I was invited by the Military Production Network—a network of antinuclear groups living near US military nuclear facilities—to come and see how they lobby their politians. In between there was an opportunity to visit weapon's laboratories like the Los Alamos National Lab and the Lawrence Livermore Lab to meet weaponeers and try to understand their point of view. While in the US, I was also invited to give talks at universities like University of California at Berkeley and University of Nevada at Las Vegas and the MIT at Cambridge, Massachusetts.

The trip was both an inspiration as well as an education. It was inspiring to meet heroes (mainly heroines) of the antinuclear movement. Women who were ordinary housewives leading everyday ordinary lives when the nuclear circus obtruded into their lives, and slowly they had to learn the differences between rads and cads and curies and furies and fight the establishment while continuing their everyday lives. People like Marylia lelly who lives at Livermore and hose house is the office of Tri- alley CAREs and who now debat as seasoned weaponeers and often 'as them tongue-tied. There was Jav ' pughlan a mountaineer who puts trekking skills to good use the mountains around Los Alamos planting monitoring devices on them and who made me accompany him on one of his expeditions. Exhausting but what an education! And Lisa Crawford who got so mad at finding uranium in her backyard well in Fernald, Ohio, that she started a movement which has brought the uranium enrichment plant to its knees and has become a political heavy-weight. And so many others that if I were to mention them all by name, this article would read as the antinuclear Who's Who.

Everywhere I went. I introduced myself as coming from the Institute for Total Revolution. This was invariably followed by a nervous twitter which made me wonder that the Americans have by now become rather nervous of revolution. In one place, however, this introduction was followed by loud cheering. Jacqueline Cabasso who has done such wonderful work in Abolition 2000. turned to me and said. "This is Berkeley."

The opportunity to witness "lobbying" at first hand was also an experience, not to be missed. Lobbying is serious business and is undertaken with care. First of all the Military Production Network has a regular staff (one woman) in Washington who arranges meetings and schedules long before the event "DC days" takes place in beginning of May. Then there is a one day orientation camp where all the "lobbyists" including some as young as twelve and fourteen are told about whom to meet; their previous positions on issues of interest to the network; the position of the network on various issues, etc. Before every meeting there is a pre-meeting amongst the participants and the group leader chalks out how he she will conduct the proceedings; who will say what; who will take notes; the actual meeting is immediately followed by a debriefing session where every scrap of information that one may have learnt is analysed and if found to be important to the whole group is immediately reported Amongst the people I met were a Senator, a Congresswoman, the head of the Nuclear Regulatory Agency, the Assistant Secretary of the Department of Energy and the Deputy Chairman of the Arms Control and Disarmament Agency.

Often during the trip I found myself in an extremely strange position that of having to defend the Government of India's nuclear weapons policy. The reason being that while the official kinds I was talking to were very willing to lecture India about not having nuclear weapons. I found that their own commitment to dismantling their own huge stock of nuclear weapons was not that strong. One person said. "We don't need thousands of nuclear weapons, but we do need hundreds to defend the "Free World" I said as clearly as I could that while I personally opposed the nuclearisation of India and felt that it has been and would continue to be a disaster. I do not expect a non-nuclear India in isolation and only efforts which are seen to be genuinely disarmament efforts are likely to succeed: mere non-proliferation efforts however sugar-coated will not work.

The trip had many memorable moments. Meeting Dr. John Goffman was a long cherished dream. Time spent with my host Arjun Makhijani and his extended family at IEER; with friends like Zia Mian and Ramana, has

already resulted in access to new and startling information. The indian government has been very forthcoming with information periodically asked by the US ambassador about the Indian nuclear programme. The heads of Department of Atomic Energy have been almost obsequious in providing this information. A good deal of such information is now available through the Freedom if Information Act at the George Washington University in Washing on DC. We intend over the next few issues to publish some of these arraival documents in *Anumukti* so that readers realise what sort of information, the guys who make such a fetish of secrecy in nuclear mattter who hold the infamous Atomic Energy Act of 1962 like a stick to energy silence, who have had the gall of calling antinukes as foreign agree glow generous and forthcoming they have been with actual representative? of foreign governments.— *Surendra Gadekar*

● Privatise and Perish

The Delhi based B.K. Modi group of industries has sought the opinion of the Department of Atomic Energy to set up a nuclear power plant in collaboration with the French power company Electrieite du France, confirmed DAE sources.

The sources said the atomic energy establishment was open to a dialogue on this issue. "The project, if finally approved should be technically attractive and above all consistent with the country's political thinking," a DAE source told this newspaper.

Emphasising the need for international collaboration, the sources said French possessed an advanced level of nuclear technology. Chairman and managing director of Nuclear Power Corporation Y.S.R.Prasad shared the view of the DAE officials: "Our mind is open on this matter. We are awaiting the financial and technical details of the project."

During a talk on Thursday organ* ised by the Nehru Centre, director of the Bhabha Atomic Research Centre (BARC) Anil Kakodkar said at present the power system in India was dictated by financial consideration. "NPC has evaluated certain possibilities for coughing up resources."

Source: Times of India

Six Determination: -the $$$Y way

Boys or Bust

Instead of Amniocentesis followed by murder, the better way to father boys is to join the nuclear industry. Nuclear Engineering International (NEI) has reported on a study showing that men who work at the Sellafield nuclear facility in Britain father 109 boys for every 100 girls. As NEI explained, the fact that the Sellafield work-force should produce such a high proportion of boys-the average is 105 to 100 girls-is not surprising, because younger men tend to produce a higher proportion of male offspring. However, the study also revealed that "men who had received over 10 milli-Sieverts [of radiation] in the three months before conception fathered 140 boys for every 100 girls." Of course, there is a catch to it. A study carried out by an *Anumukti* te im at Rawatbhata showed that a much higher proportion of couples living near the plant were either steriie or unable to bear living children.
Source: Bulletin of Atomic Scientists

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Demand drafts should'. be drawn on the State Bank of India, Valod (Coae: 0531) For cheques and drafts drawn on other banks, pleas/ add Rs 10/- collection charges

Subscriptions, donations and enquiries regarding circulation should broad dressed to:

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Sampoorna Kranti Vidyalaya
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Anumukti Team.zahv Hansa,
Daksha, Vaishali, Philips, Kalpesh,
Charusmita,Sanghamitra and Surendra
Published by S.Gadekar for sampoorna Kranti Vidyalaya

Publication Date: August 24,1997

PRINTED MATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Anumukti: Volume 10, Number 3 ***December 1996/January 1997***

Directions for carrying Explosive Nuclear Wastes Through Metropolitan New York.

Enter Long island Expressway at Brookhaven. Proceed west. Exit at Hoyt Street in Astoria. Turn left onto Astoria Boulevard. Trundle under the elevated tracks there. Turn right to ramp for the 59th street Bridge. Cross the Bridge. Follow local street travelling west until Amsterdam Avenue. At Amsterdam turn right. Proceed North.

Special Note to Drivers of Trucks Carrying Explosive Nuclear Waste through Metropolitan New York.

check oil levels every five milts.

change fan belt every thousand.

check tire pressure every morning..

change tires.

Buy *radials.*

check shocks every hundred.

check rear-view mirror and side-view mirror incessantly.

Keep eyes on rod.

Grant all other vehicle and each pedestrian

the right of way.

Do *not pass.*

Do not drive in the rain.

Do *not drive in the snow.*

Do not drive *in the dark.*

Signal.

use headlights on high beam.

Go slow.

Do *not break suddenly or otherwise.*

Think about your mother

and look out for crazies.

June Jordan
Atomic Ghost: Poets Respond to the Nuclear Age.

LETTERBOX

I have been subscribing to *Anumukti* for the past few months and find it very useful. Since I live in the USA, I would like to see more information on the Indian nuclear industry. Perhaps, other readers of Anumukti in India can contribute by sending in newspaper clippings related to our nuclear establishment. With some critical editing and commenting, even a press release from them can provide a handle to understand what is happening within the facilities.

Apropos your editorial (*Anumukti, Vol. 10, 41)* on the Koodankulam Reactors - . The reality is that it is the Russian nuclear industry that is really in trouble. But, like nuclear establishments all over the world, they still carry a lot of clout and hence there is still quite a bit of official support for their views. The following excerpts from an article by Kalyan Shankar in The *Hindustan Times* on the sorry state of the Russian nuclear industry should be of interest in this regard.

The future of the Russian nuclear industry does not appear to be very bright While on the one hand it does not attract the younger generation any more, many scientists of the Soviet era have left the country for greener pastures. The Russian youth today is looking for a glamorous job in a multinational company or set up his own business rather than opt for the specialised nuclear field.

The Russians are also worried about the brain drain and lesser investment in the nuclear industry. For instance at the prestigious Kurchatov institute in Moscow, which was the birthplace of the Soviet Union's atomic weapons program me, 7000 workers have viol been paid their wages for months. The institute is reported to have received barely a third of its budgeted amount for the year I9V6.

Continued on page 7

From The Editor's

Like the roof of the CAN DU type reactor at Kaiga which crashed of its own weight in 1994, the whole Canadian nuclear programme seems to be crashing down, or getting delaminated to use the correct nucleo-lingo. Since Canadians were the guys who taught Indian nucleocrats their tricks, this has major implications for the Indian atomic energy programme as well.

In the early 1960s when major decisions were being taken regarding the nuclear programme, Dr Homi J Bhabha, the father of the Indian nuclear effort decided to make CANDU the main reactor type in India. The reasons behind this choice were:

- It used natural uranium as fuel instead of enriched uranium. India had no enrichment facility (it still doesn't) and did not want to become dependent on foreign suppliers for fuel.
- Uranium resources of the country were small and CANDUs had the smallest requirement of uranium both in the core and as yearly replacement. At the same time it produced comparatively larger quantities of plutonium which could be used to fuel a breeder programme with the ultimate view of utilising the vast thorium deposits of the country.
- CANDUs had online refuelling capacity which meant that theoretically they could run longer without refuelling outage, required less maintenance, gave less of a radioactivity dose to workers and were overall cleaner systems than other reactor types then in consideration.
- They were pressure tube systems and did not require manufacture of large pressure vessels which were beyond our technological capabilities.

For all these reasons Bhabha preferred the CANDUs as the mainstay of the Indian nuclear programme, despite the fact that their efficiency as electricity producers was low and they required the use of heavy water which was expensive. But for the two Boiling Water Reactors at Tarapur, all of India's nuclear power reactors are of the CANDU type.

During the early years of operation in Canada, the CANDUs' performance was the best in the world with capacity factors of many reactors in the high nineties. Unfortunately, while Canadian CANDUs were setting records as the best performers in the world, Indian CANDUs were setting records as the worst. The capacity factors of the Indian plants were usually in the low forties and sometimes in the low twenties. That is when they did run which was not most of the time. These problems were airily dismissed as "teething troubles" by Indian nucleocrats.

However, as years went by the performance of the Canadian CANDUs declined precipitously and they started rivalling their Indian counterparts. What the decision to close seven of these reactors in one shot means is that the problems of ageing that they are encountering are not capable of solution by simple means and are inherent in the design which despite its early promise has failed to live up to expectations. An organisation responsible to shareholders has decided to cut it's losses in order to survive. The article on page 3 details the problems faced by Canadian CANDUs.

In our next issue, we will have a detailed comparison between the operating records of Indian and Canadian CANDUs and show that the record of the Canadians in running these reactors has been far superior to that of the Indians by any objective criteria. Thus, we should take heed from their decision to lay off seven of them in one go and shut down these fatally flawed machines while there is still time before a catastrophe strikes.

The CANDU Collapse

Seven Canadian Reactors to Shut Down

Toronto Ontario Hydro announced on August 13, 1997 that it would shut down its oldest seven reactors within the next year. This includes four 515 MWe reactors at the Pickering "A" nuclear station, just east of Toronto, and three 848 MWe reactors at the Bruce "A" nuclear station on the shore of lake Huron near the town of Kincardine. Ontario Hydro had previously shut down *one* reactor at the Bruce "A" station in 1995. Ontario Hydro is also shutting down Canada's last remaining heavy water plant at the Bruce site. CANDU reactors need heavy water for both coolant and moderator. Dave Martin, Research Director of Nuclear Awareness Project, stated, "This is the largest single nuclear shutdown anywhere in the world. It's the beginning *of* the end for nuclear power in Canada."

The Bruce "A" reactors lasted less than half *of* their expected 40-year lifetime. The Pickering "A" reactors lasted only 25 years, despite having been re-tubed at cost of $I billion (Cdn).

The shutdowns will leave Ontario Hydro with 12 reactors four at the Pickering "B" station; four at the Bruce "B" station; and four at the Darlington station. Ontario Hydro refers to the current shutdowns as 'lay ups". implying that the reactors may be re-started at a later date. However, Nuclear Awareness Project believes that the reactors will never be restarted, for economic, as well as environmental and safety reasons.

"The Ontario Hydro shutdown will also seriously hurt the chances of foreign CANDU sales by Atomic Energy of Canada Limited (AECL).'' said Dave Martin. AECL is a Canadian crown corporation that designs and markets CANDU reactors. AECE is currently seeking to build reactors in Turkey, Romania, and the Republic of Korea. CANDU performance has declined dramatically in recent years. In 1996, Ontario Hydro's 19 operating reactors ran at an average capacity factor of 66%. The Pickering "A" station had a capacity factor of 36%. and Pickering *"B"* 49% in 1996. Martin added, "The message is clear: do not buy CANDU reactors".

Closure of the problem-plagued Pickering "A" reactors vindicates ten years of public education work by activists with Nuclear Awareness Project and its local affiliated group, Durham Nuclear Awareness (DNA). The four ageing reactors, now over 25 years old, were the oldest operating CANDU reactors in Canada, and have been the subject of several recent controversies.

In May, it was revealed that i Ontario Hydro had dumped more than 1,000 tonnes of copper, zinc and other metals in Lake Ontario. The metals were being eroded from the Pickering stations' brass steam condensers over the last 20 years. Durham Nuclear Awareness has requested an investigation under Ontario's Environmental Bill of Rights, alleging that Ontario Hydro officials knowingly reported incomplete environmental data to the Province of Ontario.

In July, Ontario Hydro revealed that it had failed to report tritium contamination of ground water on the Pickering site for the last twenty years. In 1979 it found 2,150,000 becquerels per litre (Bq/L) of tritium in ground water, and in 1994 found 700,000 Bq/1. Tritium can cause cancer if ingested. Ontario's current "objective" for tritium in drinking water is 7,000 Bq/L, but in 1994 a provincial advisory committee recommended that this level should be reduced to 100 Bq/L, and brought down to 20 Bq/L within five years.

While Canada decides to shutdown its CANDUs, India decides to go in for expensive retuning which as experience at Pickering shows, doesn't always work because no one in the establishment has the guts to take a decision of shutting down even worthless junk

Ontario Hydro will increase the use of coal and oil-fired stations to compensate for the closed nuclear reactors. In the last four years, the giant utility has decimated its conservation programs, and recently cancelled its first tentative efforts at a renewable energy program for independent power producers. Added coal and oil generation will result in major environmental impacts. The Ontario environmental community is rallying to demand a truly sustainable energy future based on demand management and renewable energy, with the use of gas-fired cogeneration as a transition technology.

A History of Some Selected 'Significant Events' at Pickering Nuclear Generating Stations

August 1, 1983 — Pickering reactor 2 had a 'loss of coolant accident' (LOCA), after a pressure tube had a metre-long rupture. The entire station was shut down, and the four reactors at Pickering *"A"* were eventually retubed at a cost of about $1 billion - more than the original $716 million cost of the station.

November 22, 1988 — Pickering reactor I had a power excursion caused by operator error that caused damage to 36 fuel bundles. The cooling system was contaminated by radioactive iodine, which was vented over several weeks following the accident. Ontario Hydro did not believe that such an accident was possible, and had to revise its operating procedures and retrain staff.

September 25, 1990 — Pickering reactor 2 had a "severe flux tilt", with large power shifts in the reactor core, caused in part by the CANDU design. Staff spent two days trying to stabilise the reactor core before shutting it down, and were later criticised by the AECB for not shutting it down immediately.

August 2, **1992** — Pickering reactor I had a heavy water leak from a heat exchanger that resulted in a release of 2,300 trillion becquerels of radioactive tritium into Lake Ontario. This was the worst-ever tritium release from a CANDU reactor, and resulted in increased levels of tritium in drinking water from Whitby to Burlington.

December 10, 1994 — Pickering reactor 2 had a major 'loss of coolant accident' (LOCA). A pipe break resulted in a spill of 185 tonnes of heavy water, For the first time ever, at a CANDU, the Emergency Core Cooling System (ECCS) was used to prevent a meltdown, and about 200 workers were involved in the clean-up. The reactor was restarted on February 14, 1996.

July 21, 1995 — Two technicians carried out work on the wrong reactor (Pickering reactor 5 instead of reactor 6), disabling the second fast shutdown system on reactor 5, which was operating at full power at the time.

While The Canadians Shutdown Their Own Reactors, They Continue To Promote Similar Reactors For Sale in Turkey, Romania And In Other Parts Of The World

February 19, 1996— About 500 tonnes of water spilled into the #6 reactor building when employees working on an Emergency Water Supply valve failed to isolate it from the system. An investigation revealed that safety equipment could have failed due to water damage, and both the primary and backup heat sinks were actually lost for a section of the reactor core. The accident blew a 60 lb. valve component 6 feet into the air, almost hitting a worker and shot water up to the reactor building dome.

April 15, 1996 — Pickering reactor 4 had a heavy water leak from a heat exchanger that resulted in the release of 50 trillion becquerels of tritium into Lake Ontario. The level of tritium in local drinking water peaked at about 100 times the usual level.

April 21, 1996 — All eight reactors at the Pickering nuclear stations were shut down to repair a backup valve on the Emergency Core Cooling System. The flaw was detected on April 15th, and the system had been tested one month earlier. Hydro did not advise the public of this situation until April 20th.

October 11, 1996 — "Drug paraphernalia" were found in the Operating Island' at the Pickering nuclear stations. A station manager commented: "The continuing discovery of such items in the plant is both embarrassing and a threat to our recovery and survival as a business." This was one of five significant event reports relating to illicit alcohol and/or drug use in the Pickering nuclear stations in 1996.

May 17, 1997 — A media report revealed that Ontario Hydro had failed to report the dumping of more than 1,000 tonnes of copper, zinc and other metals into Lake Ontario from the Pickering stations, due to the erosion and corrosion of brass steam condensers. DNA has requested an investigation under the Environmental Bill of Rights, alleging that Ontario Hydro officials knowingly reported incomplete environmental data to the Province of Ontario.

July 30,1997 — Ontario Hydro revealed that it had failed to report tritium contamination of ground water at the Pickering nuclear generating station for the last twenty years. In 1979 it found 2,150,000 becquerels per litre (Bq/L) of tritium in ground water, and in 1994 found 700,000 bequerels/litre

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If Wishes were Horses Department

So far out that they might as well be in space

Optimist at IAEA symposium see 1,000 new reactors by 2050

Nucleocrats fancy themselves us futurologists. I used to think that this was a disease confined to India. But I find that it has spread worldwide and in fact some nucleocrats abroad are worse affected. As predictors of the future they have a record which is far inferior to that of even the astrologers.

Just twenty years ago nucleocrats were confidently predicting that there would be 1,000 reactors by the year 2,000. With barely two years left they have over half the target still unreached. Undeterred by these minor inconsistencies, they are now saying that there would be thousand more in another fifty years. Only one thing can be said with any certainty about these latest predictions. The predictors won't be around half a century hence in case anybody wants to question them!

Featured speakers at an IAEA hosted symposium this month optimistically forecast a major expansion of nuclear power during the coming five decades. "The world will have to add up to 1,000 reactors to meet energy demand," said Dan Meneley, chief engineer at Atomic Energy of Canada Ltd. (AECL). "Our low scenario is 300 new reactors. It might be zero, but we don't expect that to happen."

Meneley summarised the third of six "key issue papers" working groups prepared by consensus for the International Symposium on Nuclear Fuel Cycle and Reactor Strategies. The symposium, co-sponsored by the OECD Nuclear Energy Agency (NEA), the Uranium Institute and the European Commission, was held in Vienna from June 3-6, 1997. It was a follow-up of the 1980 International Nuclear Fuel Cycle Evaluation (INFCE).

The conference began by describing energy supply and demand scenarios through 2050, and continued with detailed discussion of the future of the nuclear fuel cycle.

Still A Diehard Optimist

In his opening speech, IAEA Director Blix said "new realities" had emerged since the late 1970s, when the U.S. government initiated the International Nuclear Fuel Cycle Evaluation (INFCE), "and it seems appropriate again to consider various aspects of different nuclear fuel cycle options." In 1980 he said, world nuclear power capacity in 2000 was predicted to be between 850 and 1,200 gigawatts (GW). Capacity stands today at only 351 GW and almost certainly "will not be greater than 380 GW" by 2000, Blix said. In addition, "the predicted commercialisation of fast breeder reactors has not occurred," and "the closed fuel cycle has not taken hold."

Based on three scenarios (ecology driven, middle course, and high growth), the conference's first issue paper projected world nuclear generating capacity by 2050 at somewhere between 333 GW and 1805 GW. The scenarios were based on analyses by the International Institute for Applied Systems Analysis, in Laxenberg, Austria and on data from the World Energy Council.

In a separate study prepared for the discussion, five experts from the Los Alamos National Laboratory (LANL) predicted that nuclear power would remain concentrated in the OECD countries until about 2050, then shift by 2100 toward developing countries including China. If a carbon tax is levied during the next century, LANL said, "the economic niche of nuclear power will be widened, while moderately decreasing overall primary energy demand and GNP." But, the LANL experts forecast, its impact on green house gas abatement will be limited "unless nuclear energy moves into non-electric applications."

Breeder reactors will enter the market in the 21st century, they said, "only if significant costs for fossil fuels arise" beyond those used in their model, if strong carbon taxes are globally applied, if low capital costs are possible, and under assumptions of limited uranium resources.

By contrast, the consensus issue paper assumed that fast reactors would be introduced after 2030 and by 2050 would represent about 10 per cent of the worlds nuclear capacity. For LANL, a 10 per cent breeder share could only be reached around 2100, under the most optimistic assumptions.

Naoto Sagawa of Japan's Institute of Energy Economics, forecast that nuclear reactors will supply 20 per cent of the power in the entire Asian region by 2050, assuming significant energy saving (reduction in energy intensity of 1.5 per cent annually) and an expected decline in the region's average growth rate from the current 6.2 per cent to 2.4 percent in 2030-2050. But nuclear's share in Asia could be higher, he said, suggesting that fast breeders would be needed in Asia once nuclear supplied about 50% to 60% of total power. At that level of nuclear power output, uranium demand in Asia would reach 250,000 metric tons/year, and reactors in Asia alone would rapidly consume the world's natural uranium resources if we rely only on natural uranium," Sagawa said.

Menely told a June 4 press briefing that, if China is to attain the level of environmental protection enjoyed by Western countries during the next 50 years, China "would build seven hundred 1,000 MW reactors, assuming they don't have any other resources." If that were to occur, he said, "it puts us up to the number of up to 1,200 new reactors in the world" predicted by his working group.

From Here To There

But even in this gathering of Hallelujah, Praise the Lord! tub thumping believers, there were some participants who had been bitten by the reality bug. They expressed surprise that so little effort was made to discuss how the optimistic scenarios calling for major nuclear expansion would actually be realised. Former Shell executive Peler Beck said: "Too many people here were saying, we can wait, and the world will turn to nuclear power' ...In the oil business, as soon as you say your technology is mature, you're in the first stage of dying.

None of the symposium's scenarios count on renewable energy sources making a serious contribution during the next 50 years. Beck said Shell officially expects rcnewables to account for half the world's energy supply by 2050. "It's possible that nuclear will have only a minor role, but that prospect didn't even figure at this meeting," Beck observed.

Other experts said the lack of balance was caused by the inclusive, consensual process adopted in drafting the issue papers, one technology against another. Quipped one European issue paper author, "if there is a working group of five people with someone from AECL and one Indian on it, you are going to get a forecast that a third of world's reactors by 2050 will be PHWRs and a third of the fuel burned will be thorium."

In response to a query after his paper projecting 1,000 new power reactors, Meneley explained that the authors did not concern themselves with the details of realisation. "The world will need the energy," he exclaimed. Mow the reactors get built "doesn't really matter."

According to acting Nuclear Energy Agency's director General Sam Thompson, however, it is going to matter. "There can be no doubt that for some years to come, it will be difficult to make an economic case for new investment in nuclear generation if the bases for comparison of fuel costs are not radically altered," Thompson said.

Another observer noted that the forecasts presented at the symposium bore the heavy stamp of vendor companies, research and development organisations, and other technology holders "whose basic mindset is, 'when in doubt, go for a nuclear option.'"

"If any utility people had come to this meeting and had been involved in the paperwork," one U.S. DOE official said, "the results would have been more sober."

The role of market forces was barely discussed in preparation of the baseline energy scenarios for the fuel cycle studies. But Thompson warned at the outset of the symposium that "one characteristic of markets is that they tend to emphasise short-term rather than long-term interests. Even where the governments have few options, they will not automatically look towards a long-term commitment such as a nuclear plant as a solution."

Nucleocrats keep insisting that their's is a "mature technology"
in today's competitive world
"As soon as you say your technobgy is mature, you're in the first stage of dying"

The consensus working group paper on reactor strategies forecast that by 2040, between 10 and 15 GW of fast breeder capacity will have become operational. A separate French-Japanese-Russian paper on the global fast reactor outlook concluded that "fast reactors have demonstrated satisfactory performance over 45 years from the standpoint of reliability and safety, thus confirming their maturity." However, one U.S. national laboratory official commented that for units large enough to contribute significantly to future electricity production, "That statement just isn't true. He noted that operation of Superphenix in France has been beset with bureaucratic delays and technical problems, while the timetable for the restart of Monju in Japan is in doubt.

Mark Hibbs
Nucleonics Week June 19, 1997

Fly Now! Pay Throughout Your Life

On May 2 the passenger flight KL 129 of Royal Dutch Airlines (KLM) transported a package of radioactive medical equipment that was not checked sufficiently for radiation. Since February the producer of the Technetium-99 diagnostic source, Malinckrodt Medical in The Netherlands, had worked with defective radiation monitors. Royal Dutch Airlines was reproached that it transported the source unchecked, did not inform authorities and failed to inform the 115 passengers. During judicial investigations into the incident, KLM announced it would no longer transport radioactive material in passenger flights.

The Bomb Under Your Seat

The flight in question was a short hop from Amsterdam to London. What about the long intercontinental flights lasting eight hours or more. A package emitting radioactivity allowed under the rules could still make you into an involuntary nuclear worker! Whom do the rules protect? The manufacturers and the airline would both claim that they were "well within internationally accepted standards" and anyway you were subject to much greater risk just crossing the street. There is also the question of the safety of the airline crews and airport package handling staff. These things can be sitting unclaimed for months dousing unsuspecting staff with their deadly rays.

The Observer of June 22 uncovered the story. According to international transportation rules, the outside radiation limits of a package may not exceed 200 millirems an hour. The high levels on the Technetium-99 source were discovered after some weeks by a Heathrow airport (UK) employee. Radiation levels were more than 1000 millirems an hour. Malinckrodt Medical said there was contamination of radioactivity outside the lead container on a needle on top of it. This should have been checked at the Malinckrodt factory but remained uncovered due to a defective radiation monitor. Since February, employees found strange results from the equipment but no remedial measures were taken. According to officials, a passenger right above the package could have received about 150 millirems of radiation during the flight. 'Acceptable' radiation dose for the general public is 100 millirem a year.

After the publication by the Observer several authorities started investigations. According to the Dutch Traffic Inspection (RVI) both KLM and Malinckrodt violated the law regarding transportation of dangerous goods. KLM was especially reproached for not informing government authorities after the discovery at Heathrow. They were only informed by British authorities on May 23. RVI passed the case to the office of public prosecutor for prosecution. KLM fears a suspended withdrawal of permission to transport radioactive goods as penalty. Some passengers started a case to get financial compensation for future health consequences.

On June 27 another package from Malinckrodt was found at the Schiphol airport with radiation levels higher than permitted. The package was not put on a plane as it arrived too late. It was sent back to Malinckrodt. After this new incident, KLM announced it would also stop transporting radioactive materials in cargo planes during further investigations. Authorities withdrew the transport license of Malinckrodt for a few days. On June 30 the license was renewed, adding more safety requirements. However, KLM still refuses to send packages from Malinckrodt while the investigations are still going on.

Sources: WISE Communique 475
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Letterbox

Continued from page 2

However, Minatom, the Russian Ministry of nuclear power is planning the construction of ten new reactors by 2005. Russia is even trying to attract foreign investment in the reattor projects. The Russians admit that unless they improve the industry, a decade from now, the nuclear industry would be in a poor shape. More orders and more money is what is required. The nuclear scientists are happy that there are still countries like India and China and some other third world countries which need huge power and are willing to place order for nuclear reactors.

And these are the guys who are supposed to be providing finances for the Koodankulam reactors!

I am also curious about the exact cost of the project - the numbers reported in the Indian media vary from Rs 14000 crores to Rs 17000 crores, a variation of about 20% and when considering projects of this magnitude, this can be significant. Not that one takes these official numbers too seriously, given the track record of delays and over-runs of other reactor constructions. And, one expects that these numbers don't take into account other costs - for example, the cost of training Indian scientists, as mentioned by the Secretary of the AEC. I look forward to future issues of Anumukti.

M. V. Ramana MIT Cambridge,
Massachusetts USA

Fast Breeder Reactors: The Dream Gone Sour

Nuclear energy is a dream which over time turned into anightmare. Nothing illustrates this better than the sorry saga of the breeder.

Nucleocrats have always claimed that nuclear energy is an inexhaustible source of power for the future. At the bottom of those large multi-coloured glossy posters are some astronomical numbers sure to dazzle the lay public. One kilogram of uranium gives energy equivalent to two million kilograms of coal! And so on and so forth... That is the dream of the fast breeder.

99.27 % of the naturally occurring uranium consists of the isotope uranium-238 which is non-fissile. Only 0.72 % of naturally found uranium consists of the fissile uranium- 235. Thus most of the uranium recovered after so much trouble of mining and milling is of no direct use in the production of electricity. Its only use is in making bullets and armour piercing shells which vaporise on impact and cause untold misery not only on the enemy but also one's own troops who might inhale the resultant dust. However, the breeder is an arrangement where this non-fissile uranium 238 can be converted into plutonium which is again fissile and thus can be used in producing electricity or making bombs. A proper arrangement can lead to a situation where the reactor produces (breeds) more fuel than it consumes. The fast in fast breeder refers to the speed of the neutrons which cause the fission to occur. In normal (thermal) reactors, neutrons need to be slowed down (moderated) in order for the chain reaction to proceed. The fast has nothing to do with the speed of breeding which is in fact quite slow.

Once the plutonium has been produced in a reactor it needs to be separated from the rest of the spent fuel junk in a reprocessing plant. Thus, the viability of a nuclear electricity programme based on breeders, depends not only upon the amount of breeding in the reactor but also on the efficiency of reprocessing.

From the beginning the very rationale of the Indian nuclear programme has been a successful breeder. This is because despite a lot of exploratory efforts, the country's uranium reserves are small and of very poor quality. Whereas, India has the world's largest deposits of thorium. Thorium just like uranium-238 is by itself not fissile but can be converted to fissile uranium-233 under intense bombardment by neutrons in a fast breeder. Thus for the Indian nuclear programme to be of any relevance to meet the country's electricity needs, success of fast breeders and reprocessing technology is a prerequisite.

In the early days of the nuclear dream, all nuclear establishments all over the world were of one mind regarding the course to follow. All roads led to the breeder.

However, with passage of time and wisdom having dawned through experience, many countries decided to opt out of the breeder. The reasons for this bout of revisionism were the following:

- ■ Unlike in India uranium in other parts of the world turned out on further exploration to be far more plentiful than early fears had indicated. Thus, fears regarding shortages of supply of uranium receded further and further.
- ■ This had adverse effect on the economics of the fast breeders since their economic viability was postulated on high uranium prices. The cost of electricity produced in fast breeders turned out to be three times more expensive than the already costly nuclear electricity. In a competitive world breeders became an idea with an ever more distant bright future.
- ■ While small laboratory scale plants were successful in operation, scaling them up to large industrial scale units proved to be far more difficult than envisaged. The history of the Superphenix, the first of such efforts is a vivid demonstration of the old axiom of there being many a slip between the cup and the lip.

While plutonium is produced in both thermal and fast breeder reactors, its quality is vastly different. Fast breeders produce weapons grade plutonium (in fact this fact was the very source of their attraction to countries where the "peaceful" atom did not mind prancing about in a war dance). But in other countries especially those like the US which had huge quantities of weapons grade plutonium already accumulated, the easy route to such plutonium by others was viewed with suspicion and weapon proliferation concerns became paramount.

As the dream started fading, only two countries with an obsessive concern regarding security of fuel supply still stuck to it, France and Japan. The French decision after Herculean efforts to throw in the towel leaves Japan alone as a country with serious plans for future FBR construction. The Japanese breeder record is also nothing to write home about as well. The 300-MW demonstration breeder Monju was closed after a sodium fire in December 1995 and has been dormant ever since. Once the cornerstone of the Japanese nuclear program, Monju is now symbolic of a Japanese nuclear identity crisis.

That leaves the field wide open with only Russia and India still abiding by the old faith. Although Indian nuclear programme can't do without the breeder nobody in the world considers India to be a serious player since the Indian nuclear establishment has not shown any initiative to do anything truly innovative during the last almost fifty years of its existence. Also it's record in running a small 14 MW Fast Breeder Test Reactor (See adjoining article) has been anything but inspiring. There is also Kazakhstan which has a 150 MW breeder in operation since 1973, but then Kazakhstan's technological prowess are in a class even more exalted than that of India.

The position of Russia is different from all the rest. First, they have large supplies of other fuels and are not really dependent on breeder. They have demonstrated undoubted technological skills. However, their record regarding nuclear technology has been truly world shattering with names like Chernobyl and Kyshtym and Techa river etched on for ever. But luckily they have no money to pursue this or any other dream. May be their dream is that if they show enough interest and some progress, others would pay them not to pursue this dream.

Surendra Gadekar

Sources: Based on material from WISE News Communique 475

Fast Breeders Presently in Operation

COUNTRY	NAME	POWER (MW)	START-UP
India	**FBTR**	**14**	1985
Kazakhstan	**BN-350**	**150**	1973 I
Russia	Bjelojarsk 3	**600**	1981
France*	Phenix	**250**	1974
Japan*	Monju	**300**	1995

***Status uncertain: not closed, not functioning**

I Fast Breeders Permanently Shutdown

started	Closed	NAME	COUNTRY	POWER (MW)
1949	1952	Clementine	USA	0,025 th
1956	1957	BR-2	RUSSIA	0,1
1954	1959	BR-5	RUSSIA	
1951	1963	EBR-1	USA	
1961	1965	Lampre	USA	1 th
1966	1972	Fermi-1	USA	66
1969	1972	sefor	USA	20 th
1962	1977	DFR	UK	
1975	1994	PFR	UK	
1967	1982	Rapsodie	FRANCE	40 th
never	1983	Clinch River	USA	280
1988	1988	PEC	ITALY	120
1977	1988	KNK ll	Germany	20/l00th
never	1991	Kalkar	Germany	**346**
1965	1995	EBR 2	USA	20
1985	1997	Superphenix	FRANCE	1240

th stands for thermal output which is usually one fourth of the electrical output

FBTR: Designedly 14 MW finally joins the qrid after 12years at 1 MW (Applause)

India V fist Fast Breeder Test Reactor (FBTR) at Kalpakkam is operating at a slightly higher output than previously, but the unit is not breeding and has just started producing electricity, joining the grid at a rated output of I M We.

A single spent Fuel subassembly has been removed from the first core and subjected to post-irradiation tests in hot cells, officials said. The irradiated subassembly, and two more still in the core, will be reprocessed when a pilot chemical separation line for FBTR fuel is operating, anticipated in 1999.

FBTR is designed to run at an output of 42.5 MW(thermal), and now operating at 12.5 MWt, officials said. After years of delays, the unit went critical in 1985 but, as of 1993, never operated at a power level above 10 MWt (NW, 13 May 93, 17). Officials said last month that the breeding ratio of FBTR is less than one, and that the reactor is not producing electricity.

According to Indian officials, the Department of Atomic Energy (DAE) and the Indira Gandhi Centre for Atomic Research in Kalpakkam, which operates FBTR, are constructing a pilot facility to reprocess some spent fuel from the reactor. Officials said they anticipated that, provided financing is forthcoming, the breeder fuel reprocessing line may be finished in 1999. The officials said the pilot plant is being built adjacent to a completed commercial spent fuel reprocessing plant for PHWR fuel at Kalpakkam, and that the two plants may share some common facilities. Equipment for the breeder fuel reprocessing line is designed and built in India, these sources said; materials and mechanical testing has revealed no apparent problems.

The design throughput of the pilot breeder fuel reprocessing line will be "very small," one official stressed, since the purpose of the project is to demonstrate the technology by reprocessing a handful of FBTR subassemblies. The DAE plans to build a larger reprocessing facility to accompany a 500-MW fast breeder which is still on the drawing board. By the time the pilot reprocessing line for FBTR is ready to operate, they said, it is anticipated that at least two more irradiated subassemblies, in the reactor's first core after 12 years of operation, will be removed.

Mark Hibbs, Nucleonics Week July 10. 1997,

SUPERPHENIX Dies A Premature But Well Deserved Death

Superphenix, the first commercial and largest Fast Breeder Reactor in the world, will be closed this year and not in 2020 as originally planned. The new Socialist Prime Minister Jospin announced the closure on June]9. Dominique Voynet, the new minister of environment, from the Green Party, confirmed the government's decision to shut it down. The government will take six months to work out the technical details of the closure and to discuss it with its foreign partners.

The sorry history of the Superphenix plant began in 1974 with the founding of NERSA, the European Nuclear Society for Fast Breeders. Partners were: the French EdF with 51%; the Italian ENEL, 33% and the SBK consortium, 16% (made up by the German RWE, the Belgian Electrabel and the Dutch SEP). Its starting capital was French Francs (FFr) 6billion. Construction of the Superphenix started in 1975. It went into operation in 1986, but was plagued by many accidents and unusual incidents and only operated an equivalent of 9 months (278 days) full-power during the whole 11 years. June 19, 1997 the day when its colsure was announced marked the 4000th day of shutdown.

In 1994, after a variety of problems which continued to plague the plant it was decided to refashion the Superphenix from a breeder into a burner of plutonium. Instead of being primarily a producer of electricity it acquired a new role as a research tool. On September 15, 1995, the foreign partners agreed to remain in NERSA and carry their share of the operating costs until December 31, 2000, in exchange for electricity deliveries from the reactor. EdF agreed to pay for the research program.

Superphenix was closed temporarily on December 24, 1996, for repair, maintenance and reconstruction and it was planned for restart in June 1997. It lost its license in February 1997 (see "Upsurge of Revisionism Regarding the French Nuclear Success in *Anumukti* Volume 10 Number 1) and would technically not be ready for restart until this fall. The former government intended to give it a new license without a new public inquiry, but the elections came in between.

Superphenix employs 700 persons besides indirectly supporting another 2500 jobs around a 30 km radius of the plant. NERSA pays FFr 127 million in salaries and contributes FFr 100 million in local taxes. Nearly 2000 people gathered to protest the plans of the new government to close the Superphenix .

There is some uncertainty on how much the shut down will cost. Some estimates put total costs of the Superphenix up till the year 2000 at FFr 60 billion (US$10 billion). A study by the Ministry of Economy calculates the direct costs of closure at FFr 20.4 billion: 8.9 billion for paying the debts; 3 billion for closing it; 3 billion for reprocessing the spent fuel, and 5 billion for dismantling. The early closure this year instead of 2020 will add about another FFr 6 billion. The closure will cost EdF, as operator of the plant, several billions. The foreign partners will get compensation for the guaranteed deliveries of electricity through 2000 and could ask for compensation to recover damages for the early closure. A plan for decommissioning, job conversion and a new economic plan for the region has to be worked out.

There is strong opposition to the idea of the shut down among supporters of the plant. These include the energy branch of the CGT trade union, closely linked with the Communist Party, which is a partner in the ruling coalition. They warned that "no decision on closing Superphenix" can be taken without "a true democratic debate on the country's energy policy". The CGT has always strongly supported the breeder program. But now it is more concerned with the broader issues of employment and wages in the region and will not block the closure. Besides, according to Le Monde, dismantling will double the employment at Malville for the coming five to six years.

Europeans Against Superphenix, a confederation of 250 environmental and anti-nuclear groups, asked Minister Voynet on June 6, 1997, to "put an end to the biggest failure of the French nuclear power industry." They celebrated the decision to close Superphenix as a historic victory after more than 20 years of actions. The closure of the Superphenix means that the French breeder, plutonium recycle and actinide burning programs have all to be reviewed. It has still to be seen whether the plans from the new government for a 10 year moratorium for MOX production and use and a review of the reprocessing plant at La Hague, as laid down in the French Green/Socialist agreement of this spring, will be realised. If so, the complete French nuclear back-end policy has to be revised.

Source WISE News Communique 475
Europeans against Superphenix,
9, rue Dumenge, 69004 Lvon,
France

ASKING NUCLEAR QUESTIONS

In a survey of public opinion by Gallup Pakistan, when asked "in your view should Pakistan build or not build nuclear weapons", more than 80% said yes, Pakistan should build nuclear weapons. This overwhelming support for having nuclear weapons goes hand in hand with a widespread fear. Two-thirds of those interviewed expressed fears that war with India may soon break out, and more than half thought that this war would be a nuclear war. All this comes as no real surprise. For most people these questions were asked as if they had no connections and no consequences. They answered them, on the basis on an idea, perhaps no more than a feeling, that nuclear weapons would somehow protect them.

It would be worth going to each of the 1,000 households whose opinions were sought and asking them if they knew what a nuclear weapon was. Did they know what it would do if it exploded? Did they understand the way in which it was supposed to be a defence? Had they any idea about why in the Cold War between the US and USSR both sides had tens of thousands of nuclear weapons and yet still felt unsafe?

Did this 80 per cent, and more, who want the bomb ever think about the possibility that having nuclear weapons might actually make war more likely^0

Nuclear weapons raise the stakes in conflicts between states. This is supposed to be their job. It is the mechanism through which they create deterrence. It is the threat of escalating a conflict to a nuclear level, a level of such destructiveness that war becomes unthinkable, that is meant to stop war starting in the first place. But this solution to the question of whether to go to war or not only makes sense in a world of rational calculation, of states knowing what their interests are, and being able to judge them precisely. Real states are not rational, they have other interests than war and peace, and nuclear weapons increase the space that states have for pursuing these interests.

What nuclear weapons do in this situation can be seen from the Cuban example. To the Russians, Cuba was theirs, ideologically. The Cuban people had fought a revolutionary war against a tyrannical government, a government backed by the United States of America. The revolution had been the choice the Cubans had made.

For the Americans, Cuba was theirs by virtue of history and geography. It had been an American backyard.. World War III, a real war to end all wars, perhaps even the end of the human race, could have started because the Soviets wanted to deploy nuclear weapons in Cuba, to counter the American nuclear weapons in countries bordering the Soviet Union. If the Soviets hadn't made a fuss about the American weapons, why should the US make a fuss about Soviet weapons?

The Soviets had miscalculated. The US did make a fuss. They demanded the Soviets withdraw. Then it became a matter of Soviet and American pride. The deadly combination of nuclear weapons, ballistic missiles and a tiny island in the middle of the nowhere that both sides felt belonged to them, but was not actually vital to either of them. And it was the nuclear weapons that mattered. Without nuclear weapons, the Russians in Cuba posed no threat to the US. With nuclear weapons, the threat was taken to be mortal.

India and Pakistan both have nuclear weapons of sorts and they also have their Cuba. It is called Kashmir. The similarities may not be exact but they are significant nonetheless. The interests clash and the battle is fought out behind the shelter of the belief that there will not be a real war. The Indian state seems prepared to go to any lengths to keep Kashmir. The number of troops deployed there and the brutality that they are prepared to use are clear indicators of that. Pakistan, sheltering behind its nuclear weapons, has become determined to use Kashmir to even old scores.

It is not surprising then that most of the 80% or so of Pakistanis who want the Bomb also fear India. And so they should. The two are connected. Neither side may want to go to war but as recent events have shown things quickly get out of hand. A rocket attack led to more casualties than expected. It exploded into several days of shelling across the border but then the situation calmed. Suppose it hadn't. Suppose that the casualties had mounted, and Indian helicopters patrolling the Line of Control had been shot down. Suppose.. .lt is easy to write such scenarios. How far out of hand they get can be judged from an Indian opinion poll carried out last year, thirty-three percent of the people questioned said India would be justified in using nuclear weapons if Pakistan were about to take Kashmir. These were people who had thought at least that far.

Like their Indian counterparts, the Pakistanis who expressed their opinion that the war would become nuclear, were drawn from the group that thinks their country should have nuclear weapons. These are people by and large, in the famous words of General Sherman, "who have neither fired a shot nor heard the shrieks and groans of the wounded, who cry aloud for blood, more vengeance, more desolation." For those who know about war.

Sherman said, "war is hell." Nuclear war goes so far beyond Sherman's experience of fighting in the American Civil War, that to call it hell is to understate the horror.

Perhaps the question should be asked again of the 65% of Pakistani people who fear war between India and Pakistan, and the 56% who expect it to be nuclear war, whether they still want nuclear weapons but this time after they have been shown videos of Hiroshima and Nagasaki. It would be interesting to know how many of them living in Islamabad, for example, still think Pakistan should build nuclear weapons when they are told what would happen if there were to be a single nuclear explosion over their city.

The choice of example is not without significance. Hiroshima, like Islamabad, sits at the bottom of an arc of hills and had about 300,000 people. A simple nuclear weapon, the kind that India and Pakistan have, killed 200,000 of them. To help the people of Islamabad, most of whom are involved in the business of running this country, think about this issue in strategic as well as in personal human terms, perhaps they should be asked: given that a nuclear war is more likely to be started by Pakistan (since it has a much smaller army and is likely to lose a conventional war), and given that India is likely to retaliate to a nuclear attack of its own, and given that a nuclear weapon could kill two of the every three people in Islamabad, do you think Pakistan should pursue its nuclear weapons programme?

Dr. Zia Mian

A FISSILE MATERIAL CUT-OFF TREATY

The spectre of nuclear weapons continues to haunt our world. A Fissile Material Production Cut-off Convention is on the anvil. The aim of this treaty is to prohibit production of fissile material for weapons production.

All nuclear weapons require fissionable raw material -highly enriched uranium (HEU) or plutonium. Since neither of these are found in nature, extensive processing facilities are needed in order to produce these. Thus a natural route to cap the world's nuclear arsenal is to control or stop the production of these materials for use in weapons. Control strategies, however, are complicated by the fact that enriched uranium and plutonium can also be used for non-weapons purposes, especially as fuel for nuclear reactors.

The present approach has been to allow the production and use of fissile material but to monitor (or "safeguard") its use by verifying that it is not diverted to making nuclear weapons. This strategy is applied presently only to those countries that posses and use fissile material and that have signed the Nuclear Non-proliferation Treaty (NPT) as non-weapon states.

HISTORY

A production cut-off was first proposed by USA in 1956. The USSR rejected this proposal. In 1989, President Gorbachev of the Soviet Union agreed to a cut-off in production, but the Bush administration in the USA was opposed to it. The recent interest in the cut-off arises from the situation that all the nuclear weapons powers feel that they have already accumulated enough for future needs and want to prevent threshold states like India and Pakistan from doing the same.

The UN General Assembly passed resolution 48/75 which "Calls upon all States to demonstrate their commitment to the objectives of a non-discriminatory, multilateral and internationally effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices".

SCOPE

A cut-off treaty would allow states which already have stocks of unsafeguarded fissile material to maintain them outside of international safeguards, but would allow the future production of fissile material only if the material is safeguarded. While the convention will be open to all countries for signature, the states that have already signed the Nuclear Non-proliferation Treaty (NPT) as non-nuclear weapon states are already subject to all the provisions of a fissile cut-off. Thus the primary goal of the convention will be to attain the signatures of the five declared nuclear weapon states (China, France, Russia, the United Kingdom and the United States) and the three undeclared states (India, Israel and Pakistan).

A fissile cut-off would reduce the discriminatory nature of the existing non-proliferation regime by being equally applicable to both the nuclear weapon states as well as the undeclared states. The weapons states however do not want a fissile cut-off convention to include existing stocks. Thus even though the cut-off would be non-discriminatory in how it applies to different countries, its effects on the different signatories would be highly discriminatory.

IMPLICATIONS

A production cut-off would have few immediate implications for the USA and Russia. Both countries have huge stocks of fissile material and have already stopped producing further amounts. In fact, their problem has been what to do with the huge surplus.

Britain is not believed to have produced weapons grade uranium since 1963, in part because it was able to acquire HEU from the United States. It is also not believed to be producing any plutonium currently. However since its military stocks of fissile material are relatively small, a production cut-off would place reasonably strict limits on the size of its future arsenal.

France is not currently believed to be producing fissile material for weapons. However France does not make a clear distinction between civil and military materials and has reportedly used plutonium produced in power reactors to make nuclear weapons. Given the size of its stockpile, a cut-off would have little immediate impact on its nuclear-weapon program.

China is reported to have stopped producing HEU and plutonium for weapons. Because there is much uncertainty about the size of its nuclear arsenal and its past production, the size of its military stockpiles is unknown and thus the implications of a cut-off are not clear.

It is the undeclared states (India, Israel and Pakistan) for which there is much uncertainty in the implications of a cut-off. Since these are believed to have relatively small stocks, a cut-off would affect them most dramatically.

VERIFICATION

Verification is complicated by the fact that for many of the signatories of a cut-off numerous previously unsafeguarded facilities will continue to operate under a cut-off.

The core set of facilities targeted for verification would include those which produce or have, in the past, produced, HEU or plutonium for weapons. This could be widened to include operating or shut-down plutonium production reactors as well as civil nuclear facilities. The scale of a verification scheme that includes all these can be realised by noting that the United States alone has about 300 facilities which might be subjected to safeguards. An even broader system could include measures to detect clandestine fissile production.

Difficulties of verification would be compounded in countries which actually wanted to hide information from inspectors. Some of the methods suggested to overcome reluctance to disclose information are remote sensing from satellites and aircrafts, environmental sampling of air, water or soil in the vicinity of the site and independent verifications of material accounting data.

There is general agreement that the principal verifying agent of a multilateral cut-off treaty should be the International Atomic Energy Agency (IAEA) which already conducts such verification for all non-weapons signatories of the NPT. Moreover, the IAEA has significant experience applying safeguards in a variety of situations. This would mean an increase in the workload, and thus, the budget of the IAEA. It may also take time to train additional IAEA inspectors and otherwise prepare to fully implement safeguards. As a result, the convention could specify that the verification provisions be phased over a period of a few years, beginning with the core facilities.

CONCLUSION

A fissile cut-off is central to the future of nuclear arms control and provides the only way to cap nuclear arsenals. This is, of course, only the first step, since a cut-off treaty would still leave states with unsafeguarded material that can be used for weapons. However this is a necessary first step, and, in view of the dangers of stockpiling and proliferation, it is urgent.

Dr. M. V. Ramana
MIT, Cambridge, USA
(This is an edited version of an article which first appeared in Peace Magazine, Toronto)

The Hawks Soar High

Indian Position on the Nuclear Issue

Prime Minister I.K.Gujral on May 31st said that India will not sign the fissile material cut-off treaty (FMCT). In a speech at the Bhabha Atomic Research Centre, he said, "Earlier we did not sign the nuclear non-proliferation Treaty (NPT) and the CTBT in spite of pressure by power blocks. Their stand on fissile material cut-off treaty will also be dealt in a similar manner

A more nuanced version of the "official position" on the fissban and on other issues is often found at forums like the Conference on Disarmament (CD) and international conferences. For example, speaking at a recent conference in Washington, Ambassador Prakash Shah said, "When we became the lead sponsors of the UN General Assembly Resolution on FMCT in 1995, we had envisioned it within the overall context of nuclear disarmament. We remain convinced that if FMCT has any value, it has to be part and parcel of a negotiated, phased programme for the elimination of nuclear weapons.

So, is that the final position?

Despite this seemingly defiant posture, there are some signs of flexibility. For example, in response to charges of inflexibility, Indian officials usually point out that the "time" in the time-bound process is negotiable. A more substantial case of flexibility is to be found in the Indian position on the inclusion of existing stocks into fissban negotiations. The nature of the Indian nuclear strategy, to the extent there is one, is based on ambiguity about the extent of their fissile material stocks. Thus, traditionally, together with the five nuclear weapon states (P-5) and Israel, India had argued against the inclusion of stocks in the proposed basic FMCT.

On the other hand, in the domestic debate, the last few years have seen what seems to be a hardening of postures and an increased legitimisation of the idea that India should "exercise" its nuclear option, or be prepared to do so at short notice.

missile programmes, especially the intermediate-range Agni, is among the suggested preparations. A more recent public action along these lines has been the movement of India's short-range Prithvi missiles to Jullundhur.

Ever since the early sixties, sections of the Indian policy-making community have advocated building a nuclear arsenal. However, their influence has been relatively marginal, as evidenced by India's refusal to go overtly nuclear and not conducting any nuclear tests after 1974. The first indications of a shift in the balance were seen during the period before and after the indefinite extension of the NPT in 1995.

The arguments used by the bomb lobby have been broadly the following:

- Nuclear disarmament is just a pipe dream; India's moral position made sense in the past when India's nuclear capabilities were more limited. Nuclear weapons are here to stay and hence India should go about building its own nuclear arsenal.
- The fissban, like the CTBT, is a continuation of the hegemony of the P-5, and, as with the CTBT, India should oppose this treaty.
- The fissban does not reduce security threats to India in any way, but constrains India's responses and its nuclear option significantly.
- The verification of the fissban, unlike the CTBT, would involve intrusive safeguards at indigenously-constructed nuclear reactors and other facilities.

It appears that with each round of negotiations in international nuclear arms control the Indian bomb lobby has become more powerful. For the hawks, the rationale for the linkage between a time-bound nuclear disarmament process and the fissban or the CTBT is two-fold. First, it buys time so that the internal debates can be fought out and some consensus for further nuclear weapons development reached. The second rationale is that this linkage is needed to gain credibility among the majority of India's urban elite who support India's official position that India should keep its options open only as long as the other states are not willing to give up their arsenals. Indeed, there is still overwhelming support for India being part of global nuclear disarmament. A recent poll conducted by the Kroc Institute and the Fourth Freedom Forum, found that 83% of those polled supported an international agreement for the elimination of all nuclear weapons.

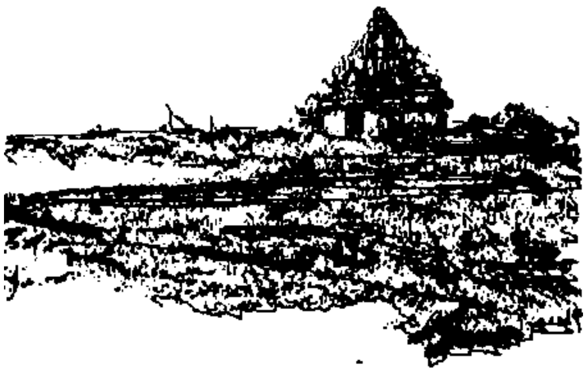
In addition to the public postures of the government officials, there is another point of view that is expressed behind closed doors. While the crescendo about fissban has been building up in the Indian media, several Indian policy-makers have been quietly talking, informally, about trying to make a deal with the United States about the nuclear question. According to these people, India would be quite willing to sign the fissban - but for a price. What exactly the price is has never been stated explicitly, but most of the proposals focus around nuclear and space technology.

This reflects the view that through its actions at the CTBT negotiations, India has proved capable of playing hard ball with the great powers, and the time has now come for the West, especially the United States, to recognise that India is a trustworthy nuclear state whose regional interests need to be accommodated. It is suggested that in return for this acceptance, India is prepared to abide by some limitations on its nuclear programs - not due to arm-twisting by the P-5, but because it is a responsible player. As in the case of the P-5 who, after having developed the requisite capabilities, embraced arms control as an extension of their security policies, India, in the view of the hawks, may be beginning to see itself as "arriving," if not as having "arrived," and so may be considering arms control negotiations in this new light. However, the price the hawks would like to extract for any Indian participation in the international arms control process is a greater legitimisation of the Indian nuclear and missile prowess and bargains that would enhance the technical capabilities and domestic position of the nuclear and space departments.

In all these debates, the voices of the doves are seldom heard. One of the important reasons for their getting marginalised is the continued resistance of the P-5 to even consider a time-bound disarmament process.

Like any other state where no single group has a monopoly on national policy-making, what India will do at the fissban negotiations or elsewhere is determined by domestic politics and the influence of different groups within the country. With the hawks on the rise, in part due to the policies of the P-5, in order that there be some positive developments, there is a special responsibility for the P-5. They have to dramatically reduce the sizes of their nuclear arsenals, along with adopting other measures that de-emphasise the role of nuclear weapons, such as de-mating warheads from missiles.

Dr. M.V. Ramana
MIT, Cambridge, USA
(This is an edited version of an
article which first appeared in
INESAP Journal)



Costs Blast Off On Underground Tests

The price of a pair of controversial underground nuclear blasts has more than doubled over original estimates, according to information supplied on June 30 by the US Department of Energy (DOE). Both tests - the first was held July 2 -are to be conducted at the Nevada Test Site near Las Vegas by the nation's nuclear weapons labs. Top-ranking DOE and lab officials have repeatedly estimated the cost of the so-called subcritical experiments at $15 million to $20 million each. The tests are designed to shock radioactive plutonium with a high-explosive detonation without producing a nuclear chain reaction. But the DOE, which funds the labs, revealed test preparations have already cost between $77-$100 million without any tests taking place.

The first blast, code-named Rebound, occurred more than a year after its original planned date. The DOE has said it delayed the tests to finish an analysis of future uses for the test site. But critics claim the DOE held off to avoid complicating negotiations underway last summer concerning a global ban on full-scale nuclear tests, the CTBT.

"The first tests are significantly more expensive than we expected, largely due to the increased time line," said DOE spokeswoman Carmen MacDougall. The DOE is asking for another $70 million for fiscal 1998, which begins October 1, 1997, but a bill approved by the House last week forbids it from spending more on the experiments until DOE Secretary Pena submits a written report detailing 1996 and 1997 expenditures. MacDougall also blamed the high start-up costs to doing something new. The cost per test is expected to come down if the labs are allowed to conduct a series of blasts, as originally planned.

Paying so much for the tests is "grotesque-, said Christopher Paine of the Natural Resources Defense Council (NRDC) in Washington. NRDC is the leading environmental group in a lawsuit filed in May 1997 that challenges the subcritical tests, among other DOE nuclear weapons programs collectively known as stockpile stewardship and management. "As a taxpayer, I'm outraged," said Livermore activist Marylia Kelley, president of Iri-Valley Citizens Against a Radioactive Environment, another plaintiff in the suit. The two subcritical tests are part of the DOE's 10-year $40-billion nuclear weapons program. Preparations are moving ahead for Lawrence Livermore Laboratory to conduct the second test this fall, before the new fiscal year begins, but no date has been set.

Actions

On the day of the first test, July 2, many actions were held. We will mention two of them. Three members of the Alliance of Atomic Veterans penetrated the DOE's security system. They went 40 miles (65 km) into the test site by mountaun bike to the Low-Yield Nuclear Experiment Research (LYNER) Facility, hid under a trailer and waited for the count-down. Shortly after they were sighted and arrested. The action proved that -deep penetration- of a vital military installation is possible. A busload of 50 members of the international press heading into the Nevada test site was blocked by activists at the entrance of the test site. Three women dove under the bus and locked themselves with chains. The chains were cut and the women were removed by force and arrested. Four people blocking the bus were also arrested. All were fined. The actions got international and local media attention.

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Can Alang Be Far Behind?

There is a ship-breaking yard at Gadani in Baluchistan. Its counterpart in India is Alang near Bhavnagar on the coast of Gujarat. The folio wing report regarding the shocking goings-on at Gadani is a reminder to activists to investigate Alang as well

The Baluchistan High Court set up a seven member expert committee June 4 to investigate charges that radioactive waste and other hazardous materials were being dumped near the coast of Gadani where a ship salvage industry is flourishing. Press reports say old ships brought to Gadani for scrap carry hazardous material, which is dumped in Pakistan's territorial waters before the ship is taken ashore for salvage. A citizen petitioned the court to probe press reports that an ageing Japan registered ship bought by a Pakistani salvage firm had dumped 150 drums of radwaste last month. Pakistan has a 750 kilometre coastline and multinational companies have explored using some marshy wastelands for storage of hazardous waste. There have been frequent reports of the salvage industry dumping hazardous materials near Gadani, known as a ship "graveyard."
Nucleonics Week June 19, 1997

Stop Atomic Insanity

Solution Number 23 To The Nuclear Waste Problem

Land Is Sprayed With Radioactive Fertiliser

A uranium-processing plant is disposing of low-level radioactive waste by spraying it on 9,000 acres of company-owned grazing land. Three and a half years after the shutdown of the Sequoyah Fuels Uranium Processing facility, workers are still sprinkling its waste, diluted by rain, from a holding pond at the rate of 10 million gallons a year.

The 'fertiliser' is called Raffinate and is registered with the Oklahoma Department of Agriculture. State and federal officials approved the fertiliser plan in 1986. Raffinate, the main waste from a solvent used to extract uranium for nuclear-plant fuel, is slightly radioactive and contains 18 heavy metals. "We were screaming our heads off when all this was happening," says Kathy Carter-White, an attorney representing residents of the area. "But it was just like the powers-that-be were going forward. We just felt violated by what happened because the land will never recover."

John Ellis, Sequoyah Fuels president, said the company is piping the material to 75 acres of Bermuda grass where as many as 400 cattle graze. Some people blame the fertiliser for such mutations as a nine-legged frog and a two-nosed cow. They also say it could be a factor in some of the 124 cases of cancer and birth defects counted in families living near the plant. There's no proof, though. "It's hard to separate out what damage came from the chimneys at Sequoyah Fuels and what was from the pallets on the ground and the groundwater and the land disposal," said Carter-White. "But the frog was found by a little boy at a country pond that was real close to where this surface application was taking place. The boy shot it and turned it over, and found it had legs sticking out all over its sternum." The big question is of course what happens with the beef of the cattle, or with the hay of the land. Already in 1987 Native Americans for a Clean Environment (NACE) claimed that hay was sold to American Indians. One shipment of hay was accepted (unaware of the possible dangers) by the Navajo Tribal Council.

Sources: Seattle Times, 4 July 1997 / NACE News, May 1987 WISE News Communique 476

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Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Anumukti Team:Zahir, Hansa, Daksha, Vaishali, Philips, Kalpesh, Charusmita, Sanghamitra and Surendra
Published by S.Gadekar for Sampoorna Kranti Vidyalaya
Publication Date: August 24, 1997

PRINTED MATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Anumukti volume 10. Number 4 **February / March 1997**

Early Morning Test Light over Nevada, 1955

your mother slept through it ill,
her face turned away
like the dark side of the earth.

wed heard
between rancheras on the ratio
that the ladles
ini ike two bears
ikat he among the stars
above Nevada
would fade at 3:15 as *though seared*
by a false sun.

The stove exhaled all nighy
a *trinity of the rings.* You *entered*
your fourth north
of floating in *the tropical,*
star-crossed water
your mother carried under her heart
that *opens and closes*
like a butter*fly.*

when the sky *flared,*
our room lit up. Cobwebs
Sparkled on the walls, and a spider
absorbed the light
like a *chameleon and beqan*
to inch forward the outer rings
as if a fly trembled.

Rooster crowed, The dog
seratched at the door. I went outside
hearing, the hens and thought
weasel
and found broken eggs, the chicks
spongy, their eyes
stunned and shrouded
by thin vells of skin.

"Don't open your eyes."
I *whispered to you when darkness*
returned. I thought of your bones
still a white gel, I remembered the story
of blood of blood smeared on the doorways,
and I placed *my hand on the balloon*
you rode in-that would slowly sink
to your birth. I *Said*
the old German name your mother already picked
for you, Robert. It means bright fame.

Robert Vasquez

A tomic Ghost: Poets Respond to the Nuclear Age.

LETTERBOX

Dear Editor,

Last year, I worked for Friends of the Earth International on a safety analysis of the Rovno and Khmelnitsky nuclear power plants in the Ukraine. These plants are VVERI000 plants - exactly the same kind of plant that the Indian government is negotiating to construct at Koodankulam. The safety analysis I did for these plants therefore has direct relevance for the Koodankulam project.

We found that a lot of questions are being asked about the safety of this type of nuclear plant. Yet the kinds of questions that are asked about the safety of this type of nuclear plant, though well - known in Europe, are not asked at all in India, and indeed, very little seems to be known at all about Russian-design nuclear plants, even amongst India's atomic establishment, which seems very happy to keep it that way.

Most of the problems with VVER 1000 safety are actually set down in a book published by the IAEA, called the 'Issues Book'. According to the Issues Book, these problems are:

- The possibility that the reactor pressure vessell may become brittle, due to the effect of neutrons on the steel. This would make it possible for it to crack violently open during an emergency, causing a major catastrophe with very large release of radiation. The government needs to ask very detailed questions about steel composition, welds, intesity of neutron flux, etc.
- The possibility that control • rods may fail to insert properly during an emergency, preventing the reactor from shutting down. Failure to shut down could also

Continued on page 16

From The Editor's Desk

The fall of the Gujaral government is not an occasion for regret. Being a jellyfish is not a good recommendation for a Prime Ministerial candidate and Mr. Gujarat's conduct in high office proved a great disappointment to many who had expected far more from him.

There is no doubt that people in the country yearn for an honest and accountable government. The issue of stability is being played up as if a corrupt government which lasts its full course is a boon in itself. Have we forgotten Shri Narasimha Rao's government so soon! What does honesty and accountability mean? It certainly does not mean that one hides behind rules and does nothing. It also does not mean that no mistakes can be made. As long as there is full transparency in the process of the government, no secret deals are being made for private gain, I feel certain that the people of India will tolerate some amount of incompetence as long as it contributes to the learning process.

Shri Nabakrushna Choudhuri, who was chief minister of Orissa from 1949 to 1957, managed to run the government for seven years with a majority in vidhan sabha of only three! This was much before the days of the anti-defection law. Nowadays, this fact seems to belong to Ripley's Believe It Or Not. Perhaps in those early days of independence the representatives of the people had not developed a "conscience" and were hence saved from having to defect to serve the people.

In this *Anumukti* number, questions regarding these issues of accountability, transparency, democratic control keep cropping up. We learn (page 3) how the US government in the fifties and early sixties was so hellbent upon bomb production that they managed to seriously compromise the health of the very people the bombs were supposedly meant to protect! This massive assault, far more insidious and damaging in the long run than anything the Soviets could have launched was possible only because the US government despite its cacophony regarding freedom was not accountable to its citizens. The great delay in publishing the results of the study makes it apparent that the government even today is not willing to be held accountable for its actions in the nuclear field.

On page 8 we see that the Russians too are unwilling to have the truth come out regarding their nuclear skeletons and the lengths they go to suppress those who try to ferret it out. On page 15 we find the government of Bangladesh falling for the same old discredited arguments of the nuclear lobby.

Amidst all this, the decision of the Indian government and the nuclear establishment, to open up and allow international inspection of the Kakrapar site (page 5) might at first sight seem like a breath of fresh air. Has the leopard changed its spots? Or rather, as my daughter would put it has the twisted tail of the dog suddenly become straight? I recently met some workers from Kakrapar who told me how they were being coached on what to say in front of the team of international inspectors from WANO. Amongst the topics which were totally taboo was the damage caused by floods in 1994, and the fact that the Emergency Core Cooling System of unit-1 has never worked to design specifications. No wonder when this is what we mean by accountability and openness, the people want to try out t new set of rulers every opportunity they get.

Surendra Gadekar

Boom!Boom!Baby Boomers

The years just after the second world war are known as the baby boom years since that was the time when a war weary generation decided to enjoy the fruits of peace. Recent evidence indicates that the name, for Americans at least, has a totally different and somewhat sinister connotation.

Ever since United States dropped the first atomic bombs on Hiroshima and Nagasaki in August 1945, there has been interest in the question of how the resulting gales of radiation and fallout affected those who survived. This question is of vital interest not only to the Hibakusha (the atomic bomb survivors) but to many other victims of the nuclear madness all over the world. Even after fifty years the question, does nuclear fallout cause an increase in ill-health among the exposed populations, still begs an unequivocal answer. In an age of the rapid advance of science, this uncertainty after decades of research on a question which affects the health of millions is incomprehensible, almost criminal.

The whole thing starts making sense only when we begin to examine the issue like any other criminal conspiracy; start looking for motives and opportunity. Who profits by this state of confusion? Who would be liable for damage to health and environment if an unequivocal connection could be proved? Who has the power to "halt the march of science"? The answer to all these questions is only one. It is the governments of the most powerful nations in the world who have had both the opportunity and the motive. It is they who made the bombs and tested them repeatedly in the atmosphere and underground, It is they who repeatedly assured their own populations that there **was** nothing to worry. And it is they who have stuck to a policy of stout denial in the face of mounting evidence.

One of the major reasons that governments can get away with their lies has been the fact that there have been very few proper studies of the exposed. Supposedly scientific studies have without any basis just assumed that a certain region like for instance North Utah had negligible fallout from nuclear testing and hence the people there could be used as controls. Since no measurements were made or if they were made, they were kept under wraps, studies made under such mistaken assumptions have never been convincing.

Contamination in some areas has been so large and its effects so stark, that despite all attempts by the government to deny any harm whatsoever, the people have just never believed the denials. American Ground Zero: The Secret Nuclear War by Carole Gallagher which was published in 1993 and has photographs and interviews of many of the victims is a detailed account of the life of ordinary people laid waste by the callousness of their own supposedly free and democratic government.

To put such a long ranging controversy at rest, the US Congress in 1980 passed a law (Public Law 97-414), which in part, directed the Secretary of Health and Human Services to "conduct scientific research and prepare analyses necessary to develop valid and credible methods to estimate the thyroid doses of Iodine-131 that were received by individuals from nuclear bomb fallout (and) to develop valid and credible assessments of the exposure to Iodine-131 that the American people received from the Nevada atmospheric nuclear bomb tests."

As part of fulfilling this mandate, National Cancer Institute (NCI) undertook a massive study beginning in 1980. In essence, the NCI study is the first time anyone has determined where the fallout landed and the degree to which people were exposed. As the chief investigator of the study. Bruce Wachholz said, "This is a crucial step in understanding the impact of the nuclear weapons tests on public health"

Effects of fallout often subtle

Researchers know that in the aftermath of a nuclear explosion, the gamma rays and neutrons that explode from an atomic fireball cause acute radiation sickness, burns, cancer, cataracts and some other diseases. These rays constitute just a small part of the fallout and cover a relatively limited distance Their impact is dramatic and often immediate. The major part of the fallout is a mixture of all kinds of radio-

Knowledge Is Not Wisdom

The Atomic Energy Commission (AEC) learned of the risks of fallout and the prevalence of hot spots with the first atomic test. Fallout was discovered 200 miles from the test site where "Trinity," the first nuclear bomb, was detonated in New Mexico in July I94S. The nuclear establishment also knew that a Western test site would spread contamination across most of the country. In I948. .well after the end of the Second World War, the committee assigned to choose a location was told by U S Air Force Meteorologist Col B G. Holzman that an East Coast site would be advisable "because the United States is predominantly under the influence of westerly winds." The committee intentionally chose a Western site because the weapons labs were nearby, which it felt would be helpful in "accelerating the pace of the weapons development program."

active fission products, and its effects can be more subtle. These radioactive poisons ride prevailing winds and can cover much of a continent. One of the many radioactive components of fallout is Iodine 131, which naturally concentrates in the human thyroid gland. The thyroid uses Iodine to make thyroxin and other hormones that regulate metabolism. The body is unable to distinguish between normal life-supporting Iodine and the radioactive poisonous Iodine. Children who do not get enough Iodine may not grow normally or fully develop mentally. Adults develop goitres: enlarged, overworked glands struggling to meet the body's demand for thyroid hormones.

Study became political issue
The National Cancer Institute study was essentially complete in 1994 and the full report is expected to be more than 100,000 pages. However, the institute showed some reluctance in releasing the results of the study. The study first became a political hot potato more than a year ago, when an advisory panel from the Centre for Disease Control requested a copy and was rebuffed. Some members of the advisory panel subsequently complained publicly that the institute was trying to suppress the data. "We are profoundly troubled by NCI's handling of this important study," said a letter issued by Physicians for Social Responsibility and the Military Production Network, a coalition of nuclear watchdog groups. "NCI officials have failed to release the material in their possession that would allow the public, health experts, policy makers and the media to begin assessing the impacts of these exposures." Tim Connor of the Energy Research Foundation and a member of the panel says, "To be sitting on this information, which shows where people are at risk, and to not be sharing that information with public health officials and others in a position . . . to mitlgate those risks is unconscionable."

Wachholz said it simply took researchers a lot of time to interpret the voluminous material, draw conclusions and summarise findings.

Most scientists agree that the next step is to try to get a better handle on what connection, exists between Iodine 131 and thyroid cancer, and many activists already are calling for studies of the counties identified in the NCI report. "The whole population ... that was young or in utero for that period through 1962 needs to be studied," says Arjun Makhijani of the Institute for Energy and Environmental Research. "This issue is going to go on for a very, very long time."

Lying Habits Die Hard

Estimates of thyroid doses, first reported in testimony to Congress in 1959 and still cited in 1997, range from 0.2 to 0.4 rad. But children on average actually received an estimated cumulative dose to the thyroid of 6 to 14 rad, and in the 24 most heavily contaminated counties, between 27 and 112 rad.

Powerful governments have a vested interest in not letting the truth come out. Hence, it is no wonder that studies done so far on potential of radioactive Iodine to cause health problems have been both tantalising and frustrating in equal measure. Some researchers like David Becker, professor of radiology at New York Hospital/Cornell University Medical Centre, calls the association between Iodine 131 and thyroid cancer "weak."

The 1986 meltdown of the nuclear reactor in Chernobyl, presents a dramatic and tragic picture. Here the link between Iodine 131 and thyroid cancer seems obvious: More than 500 children have come down with the disease. Researchers are still trying to pin down the cancer-causing isotope and dose. However, the latest studies have been showing strong evidence of link between thyroid cancer and even fairly low levels of Iodine 131 exposure. A recent study by Elaine Ron et al. (Radiation Research, vol. 141, pp. 259-277, 1995) concludes that there is "convincing evidence" of increased thyroid cancer risk to children under 15 years whose thyroids are exposed to 10 rad or more.

The data, compiled by the National Cancer Institute, is the first to show high exposure rates outside Nevada and Utah. The new information is likely to set off calls for US federal compensation to some residents where the highest exposures are predicted. Some Utah residents have already been paid by the government for living in high-exposure zones; this study shows that thousands of residents of other states may have received the same exposure. NCI officials declined to discuss the report or the potential health effects of the fallout. But the highest average exposure in the hot spot counties — 16 rads for adults and up to 160 rads for children — far exceeds the 10-rad level at which the government recommends people be monitored by a doctor. The exposure rates for children are up to 10 times higher than the adult rate because radioactive Iodine was spread largely through contaminated milk, and children tend to drink more milk than adults and their thyoroids are much smaller.

Main findings
More than a thousand nuclear tests were conducted by the US. Of these, just ninety released almost 99% of the total Iodine-131 entering the atmosphere at the Nevada Test Site (NTS). These ninety tests released about 130 million curies of Iodine-131, mainly in the years 1952,1953,1955, and 1957. This amount is enormous, approxi-

mately ten times the amount released from the 1986 Chernobyl accident, Some radiolodine was deposited everywhere in the United States, with the highest deposits immediately downwind of the NTS. The study shows that under today's federal limits, people in every county in the United States were exposed to too much Iodine 131. The lowest deposits were on the west coast, upwind of the NTS. In the eastern part of the country, most of the deposited Iodine-131 was associated with rain, while in the more arid west, dry deposition (where particles settle on the ground) prevailed. Because Iodine-131 decays with an 8-day half-life, exposure to the released Iodine-131 occurred primarily during the first two months following a test.

For most people, the major exposure route was the ingestion of cows' milk contaminated as the result of Iodine- 131 deposited on pasture grasses; other exposure routes such as the inhalation of contaminated air and the ingestion of contaminated leafy vegetables, goats' milk, cottage cheese, and eggs also contributed. For individuals within a particular age range, milk consumption can vary substantially. For example, surveys have shown that 10% to 20% of children between ages I and 5 do not consume cows' milk. Their doses were only about one tenth of those received by children who consumed fresh cows' milk at average rates for their age. Conversely, the milk consumption of 5% to 10% of individuals in the same age range was two to three times greater than the average and their thyroid doses were therefore proportionally larger. The type of milk consumed also is important. It is estimated that at that time about 20,000 individuals in the U.S. population consumed goats' milk. Thyroid doses to those individuals could have been 10 to 20 times greater than those to other residents of the same county who were the same age and sex and drank the same amount of cows' milk. Goats' milk concentrates Iodine-131 more than cows' milk.

The health of the photographic industry rated higher than the health of the people

The first "Trinity" test also resulted in at feast one hot spot in Indiana, over 1,000 miles away. One month after the test, the customers of the Eastman Kodak Company complained of buying fogged X-ray film. After an investigation, a physicist it Eastman Kodak determined that packing material that had been made from corn husks at a plant in Indiana had become radioactively contaminated. He deiuced that the origin of the contamination was from an atomic explosion. The physicisi's knowledge of the secret project was not altogether surprising the Kodak Company ran the Tennessee Eastman uranium processing plant at the Oak Ridge National Laboratory.

Kodak also reported problems from fallout after the first test in Nevada in January 1951, but this time they occurred as far away as company headquarters in Rochester, New York. After a snowstorm, Geiger counters at the Kodak plant showed readings 25 times above normal. When Kodak complained and threat;ned to sue, the Atomic Energy Commission agreed to give the company "advance information on future tests," including "expected distribution of radioacive material in order to anticipate local contamination."

In fact, the entire photographic film industry was warned about fallout. Throughout the atmospheric testing program, AEC officials gave the photographic indusry maps and forecasts of potential contamination, as well as expected fallout distributions which enabled them to purchase uncontaminated materials and take other protective measures. The National Association of Photographic Manufacurers was also given some data on the nature of the test shots, "for their own information"

But the AEC did not see fit to provide milk producers or consumers with similar information, even when the significance of the milk pathway became clear

Pat Orimeyer & Arjun Makhijani
Bulletin of Atomic Scientists Nov/Dec 1997

Beyond National Boundaries

Additional cases would also occur in parts of Canada among children who were highly exposed at the time. Some people in northern Mexico also appear to have been exposed.

Further study will be needed to address the many uncertainties about the effects of thyroid irradiation. This study should focus especially on the hot spots to identify those most at risk. However, the need to address uncertainties should not be occasion for delay in alleviation. There is ample evidence of risk and medical screening should be made available to all who were exposed as children

Since atmospheric nuclear testing has also been conducted by four other nuclear powers — the former Soviet Union, France, Britain, and China, these countries also need to make public all their data on fallout, and in particular on lodine-131 releases.

Surendra Gadekar
Bated on Pat Ortmeyer and Arjun Makhijani's article in Bulletin of Atomic Scientists and article in Washington Times

RAMIFICATIONS OF OPENING NUCLEAR POWER REACTORS TO INTERNATIONAL INSPECTION

By Vijai K Nair

The announcement by the Indian Government to throw open two nuclear reactors at Kakrapar for international inspections is not really an earth shattering policy shift that it is made out to be. On the contrary it is a feeble announcement of no consequence. It does not affect either the national nuclear technology agenda nor by making this 'concession' do we in any way decrease the antipathy of nuclear suppliers and thereby facilitate the transfer of dual use technology to India.

Status

As of date India has 10 operating power reactors; and 4 power reactors at different stages of construction. It is negotiating the construction of 2 power reactors with Russia; Besides it has a series of research reactors of which one is an operational Prototype Fast Breeder Reactor. Of these, only the units at Tarapur and Rajasthan are under bi-lateral safeguards administered by the International Atomic Energy Agency (IAEA). India has not ratified the IAEA Convention on Safety of Nuclear Plants, nor has it acceded to any of the international non-proliferation arrangements that would require it to throw open all its nuclear facilities to IAEA inspections.

Objective of the policy shift

The stated aim of the policy shift to throw open the two power reactors at Kakrapar to outside safety experts is to mollify international concerns that India is operating reactors of unsafe design and to acquire feedback so that appropriate corrective actions can be taken to enhance safety.

Verification versus Inspection.

The IAEA is authorised under its Statute to establish and administer safeguards designed to verify that nuclear material and other nuclear related items are not used to further any military purpose. It is important to note that the IAEA's safeguards system is distinct from its work in the area of nuclear safety. The IAEA carries out its 'verification activities under agreements made pursuant to a host of arms control agreements such as the NPT, CTBT, and established NWFZs which require each State Party to declare and submit to IAEA safeguards all the nuclear material under its jurisdiction or control for comprehensive safeguards. The IAEA also applies safeguards to nuclear materials in the five declared nuclear-weapon States under what are called "voluntary-offer agreements". In some States not party to the above instruments, the IAEA applies safeguards under agreements which specify, in addition to nuclear material, non-nuclear materials, facilities and equipment to be verified. As India has not acceded to any of these arrangements, verification of its facilities to audit end use is not applicable.

Come one, Come All
Come and see Kakrapar;
We have nothing to hide
Except the floods, the fire and
the untested falled
Emergency core cooling
System

Selectivity, Safety and CBMs

The Government statement clearly defines the intent • inspections designed to provide greater transparency and generate domestic and international confidence in India's ability to create and efficiently manage nuclear power facilities. The stress is on safety and not verification of material utilisation.

It would allow inspectors to examine safety systems and devices, plant design and management techniques, operating procedures, waste disposal methods etc. of the selected nuclear power plants. All other nuclear facilities including research reactors, fast breeder reactors and reprocessing facilities are excluded from this offer.

Even in the designated facility inspectors would not have access to materials or records of materials. The disclaimer that all this would be effected outside the fold of the IAEA Convention on safety of nuclear plants suggests that while agreeing to inspections of selected nuclear facilities the actual protocol would have to be negotiated with the IAEA without compromising the existing national nuclear strategy.

Therefore, while acquiring a reasonably sound knowledge of the working of selected nuclear power reactors, thereby being able to interpolate material quantities, foreign inspectors would not be able to establish exact figures of materials in the cycle or their end use. Furthermore, since the facility thrown open to inspection is exclusively for power generation without any linkages to military programmes, external inspections would not compromise the nuclear option.

Global Non-proliferation Imperatives

The purpose of the established IAEA safeguard's is to gauge the extent of nuclear technical competence and to provide the technological trip wire to assess - if and when a state may develop nuclear weapons. The Indian nuclear weapon philosophy is predicated on a relatively limited weapons capability and does not imitate the deterrence philosophy in vogue in the West. It is in India's interest to keep the military and the civil nuclear technology separate. Therefore, placing these civil facilities under limited international inspection does not compromise national strategic imperatives and fails to assuage the primary concerns of the US and other countries' non-proliferation goals.

Technology requirements of the research reactors, components of the nuclear fuel cycle and the Fast Breeder Reactors have many things in common. Under these circumstances, the new policy would not, as seems to be the wish of our policy makers, slacken the technological noose instituted in 1974 to circumscribe development of India's nuclear technology.

The Indian offer to place power reactors open to international inspection will not generate the desired technological spin off. But it would,: to the extent of actual and still existant systemic failings, compromise the nuclear establishment and with it the development of strategic capabilities. It would heighten international interference in the national nuclear sector making for avoidable political ripples. Also it would increase the fiscal overload on an already meagre sectional budget by having to pay for inspection costs.

Undoubtedly peer review is a positive approach and can bring about the much needed element of accountability. There is phenomenal expertise available within the country which could be harnessed to improve questions of safety, optimisation of assets, and environmental degradation. This can only come about if reports of the Atomic Energy Regulatory Board are placed on public audit and debated openly in the Parliament. The intention should be to give impetus to the stagnant nuclear technology and power sector through greater transparency and accountability generated through domestic assets rather than offering cosmetic gestures to an international technology restrictive regime whose objective is to cap the Indian growth in this field.

Regrettably, the Government appears to have resorted to well established norms of announcing, what is termed as, fundamental policy changes, where in substance none really exist, thereby maintaining the status quo of mediocrity. Accountability starts at home before it can credibly be projected to others. Avoiding domestic transparency and accountability and offering vague and meagre concessions to the international nuclear community, no useful purpose is likely to be served.

WANO -You Neve r Know

Despite claiming that WANO's recent peer review of the Chernobyl nuclear power station had 'seriously misjudged' the situation, government inspectors have launched a safety review of the plant's only currently operational reactor, unit 3. The WANO review concluded that there were severe management and safety culture difficulties at the plant. The restart date for Chernobyl-3 has accordingly been put back a further 6 weeks from the planned date of 1 October Ukraine insists the WANO report is an attempt to force the unit to close without compensation.

(Nucleonics Week. 25 September;

Cat's Eyes or Bull's Eyes?

IRRADIATED GEM STONES:
CARCINOGENIC JEWELRY FLOODS ASIAN MARKETS

The so-called "cat's-eye" stones are bombarded with neutrons in a nuclear reactor to change their colour from yellow to a dark brown. This makes them more valuable. A "normal" stone, for example. costs a few hundred dollars per carat whilst the dark brown ones are worth thousands per carat Methods to change colour by irradiating the stones arc legal But afterwards they must be stored for about two years to let radioactivity decay to a normal level in September the Bangkok Center for Gemstone Testing spread a preliminary warning because of abnormally high levels of radioactivity being found in the stones. They suppose the stones involved to have been distributed illegally by unscrupulous dealers who used irradiation for colour enhancement without storing them afterwards The Bangkok center is saying that anybody who finds such a radioactive stone should store it in a lead lined container until the next century. But Row do you find out if the cat's-eye you want to give your loved one for Christmas (or for some other reason) is radioactive? Never mind the fact that most people aren't privy to communiques from the Bangkok center And where does one find lead lined containers, anyway? The source of the gem stones is still unknown. According to officials at Bangkok's Gemstone Testing Center several signs point to Indonesia It is believed that low quality cat's-eyes from India have been exported to Indonesia to be irradiated there. Indonesia denies the accusations, claiming there is no way to perform the enhancement operations illegally. Thailand. India and indonesia are now all accusing each other of being the country of origin for the stones. However, irradiating stones to change their colour is not limited to those countries; it is also done in other countries such as the Netherlands (for instance at the research reactor at the University of Delft)

Source: WISE-News Communique 482

The Police State Refuses To Wither Away

The Kafkaesque World Of Aleksandr Nikitin

Just in case anyone thought democracy and the rule of law were coming to Yeltsin's Russia, the country's security police in mid-June brought additional charges against nuclear safety campaigner Aleksandr Nikitin. International commentators have been solid in condemning the prosecution of the former naval captain for treason and espionage as absurd and unjust, and the case is being watched closely as an indicator of the state of human rights in Russia. Nevertheless, the General Prosecutor's Office has allowed investigations to continue, and the Federal Security Service (FSB) remains intent on bringing the case to trial. Over the past year, signs have emerged that officials at various levels of the Russian state are disgusted by the continued persecution of Nikitin. But the latest developments show that within the ruling apparatus, key decision-makers believe that arbitrary arrest and the denial of internationally accepted legal rights need to be preserved as a serious, ever-present threat to control government critics.

After quitting the navy in 1992, Nikitin worked in St. Petersburg as a researcher for the Norwegian environmental organisation Bellona. A specialist in nuclear submarine technology, he co-authored a Bellona report entitled The Russian Northern Fleet: Sources of Radioactive Contamination. Late in 1995 early drafts of this report began to seriously embarrass the Russian government, showing that in naval bases in the north of Russia, large quantities of nuclear waste were being kept in inadequate, decaying storage facilities. Bellona's employees and supporters in Russia began to suffer crude security force harassment.

By the time the final version of the report was released in April 1996, Nikitin was in jail - arrested the previous February 6 on preliminary charges of having revealed secret information. It was only in October that formal charges of treason, espionage and falsifying documents were filed by the FSB. By this time Nikitin had been adopted by Amnesty International as its first prisoner of conscience in post-Soviet Russia. The European Parliament and officials of the European Union issued strong statements in his support. One of the problems faced by the FSB in framing charges was that the supposedly secret information in the Bellona report was all freely available to any researcher with the patience to search it out. In the course of 1996, Bellona and its supporters showed this beyond doubt. "Nikitin and Bellona have demonstrated that all of the information they published was from open sources," the US State Department observed in a January 1997 country report on human rights.

Another problem was that under Russian law, the information arguably could not be secret. The Law on State Secrets adopted in 1993 states that no information on the conditions of the environment or on extraordinary incidents and catastrophes that endanger human life and health may be classified. The solution which the FSB found to this dilemma was Kafkaesque. Nikitin was deemed to have violated two secret Defence Department decrees, so secret that their contents could not be revealed even to his defence attorneys. These decrees had been adopted in 1993 and 1994. The fact that Nikitin—who had left the navy in 1992-could not have known of their existence was of no consideration. Neither was the fact that under the Russian constitution, no one can be charged for violating acts of which they have not been duly informed.

After more than 10 months in prison, Nikitin was conditionally released on December 14, 1996 reportedly on the personal orders of General Prosecutor Yury Skuratov. Deputy General Prosecutor Mikhail Katyshev, who had been entrusted with examining the FSB's case against Nikitin, told the English-language Moscow Times on December 15 that in his view the case contained "no hint of espionage". "It is time for the prosecutor's office to admit that mistakes could have been made," Katyshev said. But Skuratov who, as the government's top legal official, had responsibility for deciding whether the prosecution should go ahead, did not order it dropped. Early in March 1997 the case was sent back to the FSB, with orders to tighten the allegations. For more than three months a renewed inquiry was conducted by a group of defence ministry officials approved by the FSB.

In April Nikitin was awarded the Goldman Environmental Prize. Meanwhile, the case grew steadily more notorious. On June 17 1997, Nikitin's lawyers were presented with a new set of charges. The defence ministry experts had decided that Nikitin had breached another secret decree. This one was dated from 1996 -after the Bellona report had been released. Reporting the response of Nikitin's lawyen to these developments, the Moscow daily Nezavisimaya Gazeta remarked on July 1: "ln the view of the defenders, the situation more and more recalls the well-known fable about the wolf and the lamb. Nikitin is guilty only of the fact that someone very much wants to eat him."

In redrafting the charges, the FSB set out to maximise the potential sentence. The charge of espionage has now been laid under Russia's new criminal code, which sets a maximum penalty of 20 instead of 15 years' imprisonment. The charge of treason has been brought under the old code, where again the penalty was higher. "Even a non-lawyer knows that an increase in liability does not have retrospective force," Nezavisimaya Gazeta commented on July 1. "Students in the law faculty get failed for such errors, but for the FSB investigators this is normal procedure." Nikitin was told on June 30 that investigations would continue for another three months, suggesting that the case might go to trial in the late autumn. When the court finally convenes, the prosecution is likely to present charges that are incompetently framed, that are very probably inadmissible under the Law on State Secrets, and that plainly violate the constitution. But that is not to say that the prosecution will lose.

In June 1996, on a petition from the FSB, the case was transferred from a civilian to a military court. According to Bellona, the FSB wants a military trial because the court would be closed, and because the security authorities would have more control over the conduct of the defence. Meanwhile Russian judges, military or civilian, do not have a distinguished record of denying the security authorities the verdicts they want.

It is no mystery as to why the admirals of the Northern Fleet, or the generals of the FSB, want Nikitin behind bars. But after a year and a half during which the persecution of Nikitin has alienated liberals at home and outraged environmentalists and human rights supporters abroad, one has to wonder why the Russian authorities allow the case to continue. Why does Yeltsin not simply order the charges dropped, recoup the support of a forgiving intelligentsia. and reap foreign accolades and aid dollars for having struck a blow against authoritarian conservatives?

The reason is that Yeltsin, along with his new team of aggressive young reformers, feel that they can not get by without the FSB and everything it represents. During May the astronomical total of unpaid wages in Russia rose once again, with no one expecting a significant fall any time soon Meanwhile, accusations continue to fly of the "reformers" delivering juicy chunks of freshly privatised oil company stock to friendly banks at derisory prices via rigged auctions Called upon to declare their earnings, government ministers put down six-figure dollar sums to "book royalties" or "lecturing fees". A robber capitalist needs a machine of repression. And to be a credible menace, that machine must be allowed to show potential dissidents that they are not safe from it behind laws, human rights commitments, or even the constitution.

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Source WISE Communique 476

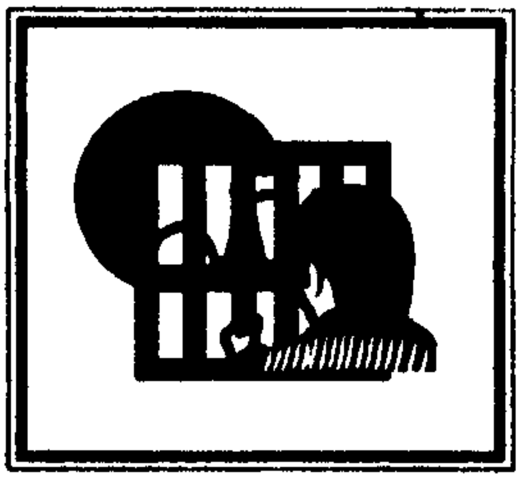
Turbulent times for fusion power

Although all early power reactors were expected to produce energy "too cheap to meter," fusion energy was the holy grail. Fusion power was supposed to imitate the sum with a tightly held plasma in which fusion reactions would be indefinitely sustained. The claims for fusion power were so great that to outsiders the reactors seemed like the perpetual motion machines of the physical world.

Well, fusion research has been perpetual money-eating machines. Assorted governments have built giant "tokamaks" —huge doughnut-shaped chambers in which powerful magnetic fields are supposed to force deuterium and tritium atoms into close quarters, with enough heat applied so that the atoms collide forcefully enough to fuse together.

Once the fusion reactions begin, the energy produced by those reactions is supposed to keep the plasma hot—a step described as ignition. After ignition is achieved, it's supposed to be just a matter of periodically adding tiny bits of fuel. The reactions should continue as a long as the plasma is confined.

For a time, it seemed as if it might work. The tokamak at Princeton produced a measurable amount of power for a few seconds, but Congress has since turned out the lights. Measurable power was also produced at the European Community's tokamak at Chulbam, England, but a magnetic reaction caused the entire structure to jump by a half an inch.



No matter how large a rector was built, however, researchers wanted a still larger one. as well as more powerful magnets 10 confine the plasma. If only, they said, they could build *a really big machine,* it would be sure to work.

When the price tag began to skyrocket for larger projects, the major powers began talking about pooling

their resources to build a single, no-expense-spared demonstration model. In 1988, the United States, the Soviet Union, Japan, and the European Community got together to develop preliminary plans for the "International Thermonuclear Experimental Reactor," or "ITER." By 1992—with Russia taking over the Soviet role—they settled down to work on design.

No expense would be spared in building the $10 billion show stopper (the powerful magnets alone would cost billions). Sure, planners said, ITER might need 100 million watts to shove it into action, but once it go going, it was "99.5 percent" certain to generate a whopping 1.5 billion watts. As they moved to the final planning stage, they touted the reactor as a marvel of international co-operation and predicted it would lead to smaller, less expensive machines that would eventually power the world.

Then last year disconcerting whispers began to circulate in the physics community. Two researchers at the Institute for Fusion Studies at the University of Texas—William Dorland and Michael Kotschenreuther—began quietly talking to colleagues about their analysis of ITER'S design, and in particular about the problem of turbulence. (Wasn't it Richard Feynman who described the problem of turbulence as something about which even God's explanation was likely to fall short?) Finally, in November 1996, Dorland and Kotschenreuther demonstrated that turbulence at the plasma's periphery would be such a source of heat loss that ITER could not achieve ignition. The design, they said, "wouldn't work, and by a sustainable margin."

Previous calculations of how ITER would work had been based on projections from experiences with smaller tokamaks. Ironically, Dorland and Kotschenreuther were able to show that ITER'S problems were not analogous—they would be a direct function of its mammoth size.

Droland and Kotschenreuther received kudos from many in their field. For instance, Princeton physicist Ed Synakowski dubbed their model "essential" to understanding what is going on in a tokamak, and Steven Cowley of ULCA said that "for the first time, there is a physics-based transport model for tokamaks" *(Science,* December 6, 1996) But a lot of the folks at the Energy Department's office of fusion research were less delighted.

Scientists began to speculate on how ITER'S design might be altered to overcome the problem. And Waston Stacey, writing on behalf of the entire U.S. ITER Steering Committee, took care not to criticise Dorland and Kotschenreuther's results, complaining in a letter to *Science* only that the magazine had been wrong to suggest that the analysis would hurt rather than help the international project.

Still, the issue was serious enough that it had to be dealt with. In January, faced with both budget problems and powerful criticism of the ITER design, the Energy Department asked a team of fusion researchers to make a "sweeping review" of the ITER design. There were particular worries about funding. Even Richard Hazeltine, head of the Institute for Fusion Studies at the University of Texas, a long-time ITER sceptic, suggested a united front. Otherwise, he said, "there is the possibility that plasma physics could die."

Meanwhile, others reacted to the bad news about turbulence by piling on. The letters column of the March *Physics Today* was full of I-told-you-sos that criticised the fusion project for its engineering problems. Letters from William Parkins, James Krumhansl, and Chauncey Starr all had the same theme: After 50 years of failure, it was time to take a breather on a technology that had very little chance to ever working. And Krumhansl predicted that if the science were ever to be translated into a usable technology, it would be "a recipe for disaster" because "neither experienced design engineers nor cost estimators" had been adequately involved. According to Starr, fusion was a principle reason why "the public has become increasingly cynical about the intellectual integrity and reliability of the physics community."

But no one can outmanoeuvre fusion advocates, it seems. In April, the Energy Department issued the results of its review. According to the Fusion Energy Science Advisory Committee, ITER'S present design is just dandy, and there are no "insurmountable obstacles" to the reactor meeting its objectives.

Its revised objectives, that is. For after 50 years in pursuit of endless energy, the goal of ignition has been dropped. According to Martha Kerbs, the Energy Department's director of energy research, ITER is no longer about power generation *(Nature,* April 24, 1997). It is now about performing "an important set of science experiments." The next question, says Krebs, is whether Congress will agree.

— Linda Rothstein

Originally Ice-Breakers Now Strike Breakers

Regional authorities in Russia's Far East have proposed converting a nuclear ship belonging to the Pacific Fleet into a makeshift power station in an effort to ease the tremendous effects a major miners' strike is having on electricity production. Such a move supposedly would give rise to a whole fleet of small, floating power reactors designed to bring electricity to remote regions.

Too Costly to Continue Even in Belgium

The most significant factors in the decision not to build new nuclear power plants in Belgium are the low price of natural gas and the high capital costs of nuclear, an official of architect/engineer Tractebel said.

Guy Frederick, general manager of Tractebel Energy Engineering, said that, while in the 1970s and 1980s the cost advantage of nuclear power was "evident," since the early 1990s "economics is now a new concern." In constant money, the cost of a nuclear reactor per kilowatt in the 1970s was "half of what it is today," Frederick said.

Under Belgian practice, the country's seven units are scheduled to be amortise 20 years after construction. However, it is expected that they will operate "long beyond the 30-years design lifetime we expected" when the reactors were ordered, he said. Examinations by utility Electrabel have shown that, "as long as maintenance is effectively organised, all components and systems can be serviced and the plant lifetime is theoretically unlimited."

Tractebel has calculated that, to prevent performance of an existing reactor from being profitable, a so-called "available cost" of 90 ECU/kilowatt/year must be exceeded by major backfires or interruptions. Calculations show that the last year safety inspection at the unit, cost Electrabel 55 ECU/K W/y. That action involved major fixes to internals and kept the plant off-line four months beyond the normal annual outage. A steam generator replacement at the plant, which kept the reactor off-line two months extra, cost 35 ECU/KW/y.

These measures represent the greatest interruptions to reactor operation in Belgium. "So it is hard to define the economic limit for operation of our reactor," Frederick said. While the economic argument is "far from clear," he said.

Frederick said that, for a new reactor project in Belgium—the country has postponed construction of an eighth power reactor after extensive study and parliamentary debate—ihe cost of nuclear fuel would be 20%, operation and maintenance (O&M) 20%, and capital cost 60S. For a competing combined-cycle plant fired by natural gas, the heaviest cost component is fuel (60%), followed by capital (25%) and O&M (15%). Figures for both projects assume the gas and nuclear plants operate for baseload generation at a capacity factor of 85% and price construction at a discount of 8.6%, the usual rate for Electrabel.

While nuclear utilities world-wide aim to slash O&M costs to keep their existing plants on line, the Belgian figures for new projects indicate that, even if nuclear O&M costs are in the future reduced by a third, "their effect on the economics of a nuclear plant project would be negligible," Frederick said. The same goes for attempts to reduce the costs of the nuclear fuel cycle.

For the competing gat-fired plant, the most significant factor is the price of gas. "If the price of gas remains stable for 20 years, gas will be out *of* reach and nuclear can't compete" in Belgium, Frederick said. However, Frederick noted that, historically, gas prices have been "hard to predict." Likewise, supply security is uncertain. "Some utility officials tell us that it is unreasonable to keep increasing our dependence on combined-cycle plants in a situation where the imported fuel represents 60% of the total costs of a kilowatt-hour," he recounted.

For nuclear power, the cost of capital is the most important factor "We have little cause of rejoice," Frederick said, since, unlike most of the world's technologies, "over the last 20 years the absolute costs of construction have continually increased." There is a "lot of talk" about streamlining by advance licensing, serial manufacturing, and simplification of regulation, "but while these steps are positive, will they have a really beneficial effect leading to a turnaround in the general trend of cost escalation for nuclear construction?" Frederick asked.

Despite his pessimism, the Tractebel manager said there are possibilities for cost-cutting, including elimination of "monopolistic" market niches enjoyed by vendor firms in the complex process of building and licensing reactors.

Frederick also said that he hoped that deterministic regulations, which currently impose a "too severe burden," might be alleviated should Belgium build an eighth reactor. But he cautioned that, "before that happens, the onward march of gas will continue in Belgium," noting that Belgium is close to finishing the fifth combined-cycle plant built since the last reactor there was started up.

-Mark Hibbs,
NUCLEONICS WEEK — May 15. 1997

ft

Short Notes From Near and Far

The secret of Ratnaballi

Mark Hibbs the legendary German correspondent of *Nucleonics Week* and *Nuclear Fuel* has done it again. Exploiting the Indian weakness for sounding off in front of white skinned foreigners, he has found out the till now well guarded secret of Ratnahalli. Ratnahalli is just six kilometres of Mysore city and ever since the construction of the Rare Materials Plant started a decade back, activists in Mysore have claimed that it was a uranium enrichment plant. Stout denials were all they ever got in reply. It should be noted that this is one of those nuclear facilities, whose existance has not been revealed officially to Pakistan as per the rules of the treaty for not attacking each others nuclear installations. The question, why was India interested in uranium enrichment when our "peaceful" nuclear programme did not use the stuff, always remained unanswered. However, in the December 2 issue of Nucleonics Week, Mark Hibbs reports that, "For the first time, to my recollection, the Indians said outright here that the plant near Mysore is meant to be used for making Highly Enriched Uranium for submarine fuel, enriched to between 30-45% U-235. BARC types categorically denied the technology is to be used for either development of a boosted device or for Low Enriched Uranium fuel for reactors." It seems that the chakkars of the Soviet leased submarine INS Chakra have not been enough for the ghanchakkars of New Delhi.

Guided Democracy Guides On

One thing to be said about nucleocrats—nothing deters them from their chosen course. Certainly nothing as ephemeral as public opinion. Like King Bruce they believe in try, try try again. People from the area of Mala, in northern Sweden, have rejected plans by the Swedish nuclear fuel and waste management company, SKB to further investigate the idea of building an underground repository for spent nuclear fuel in the region. Results from a referendum held Sunday showed 55% of residents opposed the plans. SKB expressed 'regret' on the outcome, but seemed optimistic that their efforts were gradually gaining favour with the public, citing that in 1995 a similar vote in the Storuman region resulted in a 71% vote against similar work.

Love Thy Enemy

The US and Russia have agreed to end the production of weapons grade plutonium. Under the agreement, the US will assist Russia to the tune of US$80 million, with the conversion of its three operating plutonium production plants to civilian power plants by the year 2000. Russia has also agreed not to restart 10 other such reactors, already off-line. The US has made similar promises, agreeing not to start its 14 plutonium production reactors, which have been off-line since 1989. (Reuters, 23 September)

Close on the heels of reports that only 2 US utilities have expressed interest in producing tritium for the Department of Energy's (DOE) maintenance of its nuclear weapons inventory, a senior Russian defence official has indicated that the Russian Federation would consider selling the US the tritium it needs. *(Nucleonics Week. 25 September,1997.)*

The Mess They Left Behind

As imperialist masters the British were bad enough but compared to the Russians they positively shine. The fraternal bear-hug of the Soviets has left an incredible trail of death and devastation.

Several Georgian soldiers are suffering from chronic radiation sickness and from fourth degree radiation burns. Some have developed large sores on their lower extremities due to exposure to extreme radiation. Only after several soldiers complained about pain and strange wounds was it discovered that radioactive capsules filled with Cesium-137 had been left behind by Russian troops at a former Soviet military base. So far 17 capsules have been found. They appear to be scattered on the base as well as outside of it. Georgian hospitals are ill-equipped to give proper care, and soldiers are suspicious of promises of adequate treatment in Moscow.

Utilities Advertisement in the Wake of Three Mile Island

(A found poem)

we are committed to cantor Anil openness.
It may *not be possible to answer all the*
questions.

Incidient. Core material Meltdown.

This is time to avoid emolionalism.
Truth only gets obscured
and rational decisions are Impded

leak. Emission. *Exposure.*

There are lessons to be learned.
first constitution goes to public
safety and health.
look At our record.

For radiation *consider*
X-RAYS, microwaves, the sun.

This is matter of risk assessmant.
No available energy source
is risk-free.
The question of human error must be
death
with.

It may *not be possible.*
we are committed.

DRACULA ON THE PROWL AGAIN

Rajasthan reactors on way to full-scale recovery

The following article which appeared in The Hindu of 2nd December is just a sample of the recent publicity blitz regarding the recovery of the Rajasthan reactors launched by the nuclear establishment. The achievement of replacing pressure tubes is being touted as a great triumph of Indian technology. It »$ nothing of the kind. The Canadians bad already done this more than a decade ago but that did not help their reactors last longer and they had to mothball seven of the same CANDU type reactors in one shot. Unfortunately this kind of hype is very common with the nuclear establishment and it gives a bad name to Indian scientists in general and devalues even genuine achievements.

The second unit of the Rajasthan Atomic Power Station (RAPS-II), which is set to create history as a symbol of Indian resistance to a strict embargo regime dictated by the West, will resume power generation by March 1998.

Almost given up for dead three years back, the unit, along with its neighbour RAPS-l, is on its way to a full-scale recovery. More than 250 out of the 306 coolant channels of the reactor have been replaced by a fine-tuned RAPS team. The rest of the job would be completed before the end of the month.

Once the present exercise is over, the unit has to undergo all the procedures that are mandatory for the commissioning of a new reactor. Refuelling will be followed by a series of tests. Then, each system of the plant would be run separately, followed by the start-up of the reactor.

Speaking to The Hindu near the core of the reactor where he was supervising the replacement operations, the Project Director, Mr. V. K. Chaturvedi, said safety upgradation and installation of additional infrastructure were also being undertaken simultaneously. As per the direction of the Atomic Energy Regulation Board (AERB), the country's watchdog of nuclear safety, a high pressure heavy-water injection system had been installed. In the event of any entergency related to the cooling system, 50 tonnes of heavy water would be pumped in instantly.

The above paragraph contains not one but two errors. If the interview was actually conducted near the core of the reactor both these guys would have got burnt to a crisp in a short time. The high pressure heavy water injection system is meant for pumping out hea\y water during emergencies not pumping it in.

Other additions included a supplementary control room, an additional on-site diesel generator to power the essential services in the event of floods (the reactor is situated near the Ranaprathap Sagar dam on Chambal river), segregation of power supply lines and instrumentation panels. "The reactor can now run for 30 more years," said Mr. Chaturvedi, who was deputed by the Nuclear Power Corporation (NPC), which runs all the nuclear power reactors in the country, exclusively for the revival and rehabilitation of the plant. The reactor would now run to its capacity of 200 MW.

Besides reviving a defunct reactor along with the economy of the entire Rawatbhatta region, the extremely delicate job of coolant channel replacement, which is happening only for the second time in the world, has also armed the country with a proprietary technology that could be marketed in the Pressurised Heavy Water Reactor (PHWR) services sector abroad. Pakistan, Argentina and South Korea have reactors of this category and would need replacement of coolant channels at some point of time.

The resurrection of the reactor is a show of indigenous strength in the entire spectrum of nuclear technology when Canada which supplied the unit, refused to help and dubbed the reactor unsafe in international forums. But against.all odds, the "Coolant Channel Replacement Group (CCRG)". constituted by the NPC three years back, found a solution which cost only a fraction of what Canada spent for a similar reactor.

While the Canadian technology would have cost Rs. 4 crores per channel. Indians could wind up the entire replacement procedure for the same amount, Mr Chaturvedi said .It was an operation which was 306 times less expensive, that too at a much lesser level of exposure to radiation. The end-fittings and the new coolant channels cost more than Rs. 80 crorcs

The total cost of the revival is estimated at Rs. 252.54 crores with Rs 53.6 crores earmarked for safety upgradation and rehabilitation.

The project was ahead of schedule by about six months. This would help reduce the cost by about Rs.20-25 crores. This saving would be made in the Interest During Construction (IDC) component which totals to Rs 45.31 crores. About Rs. 10 crores was saved in indirect costs too.

The problem was first noticed in the 1980s when Canada reported that the Zircalloy pressure tubes of a simi-

February/ March 1997

1$

lar reactor at Pickering had developed cracks. This led to investigations at RAPS-II which revealed that the garter springs separating the coolant tubes and the calendria tubes had moved and the former was touching the latter. This resulted in the formation of hydrides at the point of contact because of the inherent characteristics of Zr-alloy and the temperature difference between the pressure tube and that of calendria. The Canadian experience also indicated that hydride formation could lead to cracks and leak.

The new channels are made of Zr-Neobium, an alloy stated to be more stable in a radioactive environment.

The reactor was shut down in September, 1994 and after extensive studies, in October, 1995 it was decided to take out the fuel. By January 1996, defuelling was completed which was followed by decontamination. From January to April 1996 workers were trained on life-size mock-up. The removal of channels were completed in four and half months, much ahead of its schedule.

Besides enriched uranium, the core would use 18 bundles of thorium oxide which would help the reactor achieve maximum power. In fact, thorium as fuel represents the third phase of India's nuclear programme whereas enriched uranium belongs to the first phase.

In a country-wide perspective, the achievement at RAPS breathes fresh life into the country's nuclear power programme which has been hit by paucity of funds. Five more reactors, which used Zr- alloy tubes, would face the same situation at some time or the other. The CCRG will now be a near-permanent task force of the NPC.

G. Pramod Kumar. The Hindu
December 2. 1997

Editor's Note: Rawatbhata Nuclear Power Station has been operating, or rather usually not operating at the site for the last 25 years. It is somewhat late in the day for the authorities to wake up to the fact that it is situated on the banks of a river and diesel generator is needed in case of floods. There was a fire in the turbine building in 1985 and the report on the fire had specifically mentioned that power lines need to be segregated for safe operation of the plant. The fact that the authorities took as much as twelve years to do this and continued to run the plant in an unsafe manner is an indication of their callousness with regard to safety.

Stupidity is Contagious

Bangladesh decides to have a nuclear power plant

In a recent article dated October 17, 1997, the *Daily Star* reported that the Government of Bangladesh had decided to implement the Rooppur Nuclear Power Plant Project. The decision was reportedly taken at a meeting of the Rooppur Nuclear Power Project Implementation Committee with the Prime Minister in the chair and the Finance Minister, Energy Minister, Education Minister, Planning Minister and the Atomic Energy Commission Chairman in attendance. It was observed in the meeting that the "environment-friendly" nuclear power project would meet the country's electricity demands, particularly those of the northern region at tower costs. The Prime Minister directed the committee to speedily implement the project.

The Same Lies

In a report in the same daily last year, the Bangladesh Atomic Energy Commission (BAEC) engineers and scientist had pointed out that nuclear technology is considered one of the "safest" power generation systems. BAEC engineers had also indicated that the annual fuel cost of a nuclear power plant was much lower than that of a conventional gas-burned plant. Therefore, according to them, the proposed nuclear plant would be part of an optimum mix of electricity generating plants for Bangladesh.

The concept of the Rooppur project was developed in 1961 and was approved for 70 Megawatt (M W) of electricity generation. The plant site is in the Pabna district, about 180 kilometers from Dhaka. The current plan is to have a much larger plant of 400 to 600 MW capacity, which is estimated to cost about $1 billion.

To the unsuspecting general public, only this kind patently false statements regarding attractive cost-efficiency, safety and environment-friendly aspects of the nuclear power plant are presented.

Cost-Effectiveness

A BAEC scientist was quoted in last year's *Daily Star* report as saying that "although the initial cost of a nuclear plant is double that of a conventional gas-burned plant, the fuel cost is much lower than that of a coal or oil-burned plant". He further asserted that a typical 300 MW plant would cost about

$600 million. However, this assertion is not correct since the presently quoted prices for a nuclear power plant are well over S 3000 for a kilowatt. Data from constructed nuclear plants show that tremendous cost overruns regularly occur due to unforeseen problems involving safety concerns, faulty construction, etc. The Diablo Canyon Nuclear Power Plant in (he USA comes to mind as an example of such cost overruns. This two-reactor plant, designed to generate 1100 MW per reactor, was planned in the early seventies and was estimated to cost around $500 million. About 90% of the construction was completed in 1976 within budget when a new earthquake fault was discovered near the plant. Seismologists estimated that this fault was capable of producing a much larger earthquake than the one the plant was designed to withstand. The plant completion was delayed for five years and the cost tripled to $1.5 billion. In 1981, the plant was ready to start operations, when the final inspection uncovered numerous errors in design and construction process, improper quality control, inadequate documentation, etc. Another five years were required to identify and correct all these errors. The final cost ballooned to about $8 billion before the plant started producing electricity ten years behind schedule. The level of anxiety, this induced in the people, unfortunate enough to be living close to the plant, could well be imagined. The experience of Indian nuclear power plants is illustrative which have usually cost three times their original estimate.

Safety Issues

The problems of safety of nuclear power plants are all too familiar to *Anumukti* readers and will not be elaborated out here. Suffice it is to say that Bangladeshi nuclear technicians have no experience at all of a plant of this size. All they have been familiar with is running a small 3M W research reactor at Savar. It should be emphasized that a 400 to 600 MW commerciel power plant has technical and safety aspects which are not generally encountered in a small research reactor. It may be accurate to surmise that the experience of the BA EC personnel, would not be adequate enough to supervise the construction and installation of the Rooppur plant. In fact the *Daily Star* article quoted the BAEC chairman as saying that the International Atomic Energy Commission was willing to provide consultants to ensure safety in the installation and operation of the plant. It seems that BAEC will largely depend on foreign consultants to ensure safety of the plant as well as design and supply of plant parts and equipment. Such dependence on foreign experts has not always proven beneficial to third world countries.

Need for Transparency and Accountability

In addition to this, transparency and accountability is always a problem in projects involving nuclear materials. It is always easy to hide behind "national security" and "sensitive information" to withhold information from the public. There are numerous examples of evasive actions and cover-ups by commercial nuclear plant authorities regarding the extent of malfunctions, accidents and consequent release of radioactive material. A news item published in the *Daily Star* on October 27,1997 illustrates the point. The news item states: "Immediately after the explosion in Magurchara, BAEC scientist were deployed at the site to detect any leakage of radioactivity but found none. The matter was never officially made public and all concerned remained tight lipped". We are told that all the 16 missing radioactive isotopes "miraculously" escaped leakage. We cannot, however, depend on such "miracles" to happen too often.

Only informed citizens can protect their rights

In conclusion, it may be pointed out that most citizens of Bangladesh -not to mention a large population living in India—live within a 200-mile radius of the proposed Rooppur nuclear power plant. The disastrous effects of such proximal living to a nuclear plant are amply demonstrated in the case of those people living near Chernobyl Any accident in the Rooppur power plant has the potential to adversely impact the lives of every citizen of Bangladesh and of future generations All this for producing 400-600 MW of electricity when there exists a high potential of discovering large gas fields in the near future. Thus the setting up of this power plant should not be at all considered without putting these issues in perspective and without serious public debate. It is imperative that, as a minimum, the following steps should be taken by BAEC and the government of Bangladesh before any further pursuit of this project:

I. Organize public seminars where BAEC scientist and engineers will present their estimates of possible safety hazards and what steps will be taken to minimize them 2. Have public hearings in communities near the plant regarding the probability of accidents occurring during the lifetime of the plant to determine the level of risk acceptable to the population and whether it is at all willing to take such risks.

It is, therefore, incumbent upon the scientific community of Bangladesh to come forward and initiate discussions to inform the public about the issues involved. Otherwise, we may step into a possible nuclear nightmare, reminiscent of Chernobyl, with far worse consequences for the population.

Dr. Ahmad Fazlul Kabir
engineering consultant involved in evaluating structural safety of nuclear plants

■ LETTERBOX

Continued from page 2

lead to a major accident. Control rods have failed to insert properly a number of times at VVER1000 plants. Problems with control - rod insertion have also cropped up recently at French plants, leading to the costly replacement of the whole control • rod drive mechanism at many plants.

- Problems with tubing at steam - generators. This can lead to leakage of rdioactive primary coolant from the pressurised primary circuit of the reactor into the secondary circuit. If the leakage is large, it can lead to a loss of coolant accident as well as damaging other parts of the plant.

Because of the design and layout of the plant, there is a part of the plant where main steam lines cross each other, directly adjacent to emergency feed water injection lines. In earlier models of VVER, there was also safety - related electrical equipment on the floor underneath. If a main steamline were to break for some reason (for example, it would be quite likely to do so if it had water in it from the primary system because of a steam - generator problem. It could also do so because of an earthquake), it would then whip about like a monster headless snake, destroying eveything in its path including emergency feedwater piping etc.

There are also a whole series of problems with the instrumentation of control systems of VVER plants, and Seimens and Framatome are engaged in replacing most of the l&C systems of every VVER in Europe and European Russia.

I do not wish to say by this that some other brand of nuclear plant would be any better. I don't want to persuade you that for example, if you bought a plant from, say, Westinghouse or Framatome or Seimens or Mitsubishi that you would then be safe. The problems that show up in VVER 1000 plants show up in various ways in other plants too.

But safety problems with VVERI000 plants are now certainly well docummented, and searching questions need to be asked about this Koodankulam project now. The answers to these detailed safety questions are often costly, but not near as costly as not asking them is going to be.

John Hallam,
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Demand drafts should be drawn on the State Bank of India, valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/- collection charges

Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Anumukti Team:zahir, Hansa, Daksha, vaishall, Philips. Kalpesh. Charusmita, Sanghamitra and surendra
Published by S.Gadekar for sampoorna Kranti Vidyalaya printed by Ashton Offset, Surat.
Publication Date: April 27,1998

PRINTED MATTER

A Special Double Issue on Bomb Tests

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Anumukti: volume 11, Number 3 and $ **April / May /June / July 1998**

The Song of Indian Civilisation

Sitting *on a Sand dune in Pokkran*
Tathagata Buddha is smiling.
for two Thousand and five hundred years
he has been singing the mantra
of COMPASSION, of EQUALITY a*nd of* LOVE.

underneath his eyes came hordes of
shaks, *Greeks, Huns, Pathans, Gujjars and* Mughals;
Ghauri came and Khiljee too
ALL *who came got drowned in*
this ocean of compassion and became one
"Thost who came as Enemies became friends.

Their voices and their songs,
Their archilecture and their art
Their philosophies and their emotions
All became *suffused by the music of equality And* of love.

plunderers too came and went leaving not a TRACE.
Sufis came and so did saints
to find a permanent abode WITHin people's heart

Porlugese came and so did the Dutch, French and English
They lived like *outsiders and eventually left*
Left behind were their ways of thinking
The English went but Englishness remained.

It *remained* in *the life-style,* In *the language,* In educat*ion;*
In the blind idol worship of armed might.

Then came a poet who sang the songs of world love
And a philosopher who tried to raise humankind towards the Gods
And a MAHATMA *who loves the English but tried to destroy*
Englishness
who sacrificed his life to preserve our civilisation.

while today,
even though not just *out but six explosions transpire*
Beneath the ever smiling EYES *of* Tathagata Buddha
explosions that throw dust in our eyes and make us blind.

The shakti of love is immortal
It shall *overcome hatred, loathing,arrogancei and vilolence.*
*Love sha*ll emer*ge victorious, Unity* will win
Magnanimity shall TRIUMPH*, the lionhurted shal*l *prevail.*
And then once again we shall hear the conch-shells
of a civilisation *that is tolerant*
A culture that has never accepted the defeat of love before hatred
An enlightenment that has never accepted the defeat of love before
storms of animosity
The smile on the face of Tathagata Buddha

Narayan Desai
Translated from the original Hindi by
Surendra Gadekar

LETTERBOX

Tests have heightened tension

A meeting on the nuclear arms race between India and Pakistan was held at MIT. Nearly a hundred people (largely Pakistanis and Indians) attended the meeting. We also circulated the following petition against the nuclearization of South Asia.

We express our deep regret at the recent series of nuclear and missile tests by India and Pakistan, and the general militarization of the region.

Although the two governments have sought to justify the nuclear arms build up in their respective countries in the name of national security, their actions serve only to heighten tensions and increase hostilities in the region.

It is tragic that valuable resources that should be used for the betterment of the people are instead being squandered on weapons of mass destruction.

The nuclear and missile tests undermine the ongoing efforts to forge common bonds of friendship between the two countries by those Indians and Pakistanis who have been able to transcend narrow nationalist propaganda. The jingoistic rhetoric of our leaders notwithstanding, we are determined to work together toward peace and harmony in the region.

Signatures of more than 100 Indian and Pakistani scientists working in various universities in the US.

Continued on page 29

The Editor's Desk

The Smile That Makes Generations Sick

The after glow of Operation Shakti lingers on. Yes, India has done it. Our scientist and engineers and even our politicians are second to none. Recalls to mind those famous lines coined during the Russo-Turkish War of 1877-78 which gave the English language a word which describes rather well the mood in middie class India today:

We don't want to fight,

yet by jingo, if we do,

We get the ships, we got the men,

And we got the moneey, too!

Achievement at what cost

A nuclear test involves the release into the environment of large quantities of radioactive poisons. Poisons that shall linger on and on; long after the after glow fades; long after the applause and the mutual back-patting fades; long after all the scientists, engineers, and even the evergreen politicians fade; long after historical constucts such as Pakistan, China and even beloved India fade. This deliberate poisoning of our soil and that most precious of all things in a desert—water, shall continue to extract an inevitable toll. Obtaining complete and accurate data on health and environmental effects of nuclear weapons testing is difficult. This is because the principal responsibility of assessing the health and environmental effects of the testing is given to the very agencies that make and test the weapons. These agencies have overwhelming desire for secrecy and the perceive a need to build up nuclear arsenals come what may. In this mindset, it is no wonder that the health and security of one's own citizens is sacrificed at the altar of geo-political considerations. Henry Wasserman very aptly named his book describing US experience with the effects of ionising radiation as "Killing Our Own." Of one thing we can be sure. If it is found that operation Shakti has resulted in radioactive contamination which is a threat to human health, the villagers living in the vicinity are unlikely to be told anything about the fact or asked to take precautions that might reduce their risks. In our persuit of geo-political might. some have to pay the price of development. Modern versions of the ancient custom of human sacrifice for the sake of power and glory can be played to thunderous applause from a nation thirsty for international recognition. When the news first came on 11th May, we all wanted to bring out an issue within a week. Unfortunately it has taken more than seven weeks for us to come to you. We did try to register our protest through the mainstream media by issuing statements, and writing articles. But as has become the nature of the mainstream media, only the voice of the establishment is heard and amplified. The common newspaper readers in the country were fed half truths and lies through reams and reams of newsprint. In the din, the voice of hundreds of academics, journalists, social activists, poets and writers, who organised protests in different parts of the country braving attacks from the saffron stormtroopers and their lackeys, got drowned. The mainstream media gave you one side of the story. We are giving you the other.

Surendra Gadekar

Do Not Forget
Hiroshima and Nagasaki

Fight Nuclearisation of Indian Subcontinent
Through Active Protest

Just Say 'No' To Murder

Dr. ZiA Mian

India and Pakistan have both thought and done the unthinkable. With their nuclear weapons tests they have demonstrated to themselves, to each other, as well as to the world that they are both willing and now able to commit nuclear mass murder.

This was not done with universal consent. There were brave voices who spoke the language of right and wrong, and not that of power within both nations. There was a nucleardebate. But there should have been no need for one.

Nuclear weapons are not weapons in the usual sense of the word. They are devices for genocidal destruction

Nuclear weapons have become the one great exception to the sense that there are some issues that a society should never debate because the issue itself is so unethical. A simple example is that few if any societies would feel it necessary or even acceptable, to have a debate on whether it is right to kill and eat children.

When it comes to nuclear weapons, however, the moral response has been dulled. What is at issue is whether it is right or wrong to want to have, and to want to use, the power to kill hundreds of thousands, perhaps millions of people in the blink of an eye. to maim many more and to poison them so they die slowly and painfully over years from cancers and other illnesses induced by radiation. The experience of Hiroshima should have been enough to convince anyone that nuclear weapons were an affront on humanity. Despite this there has been a world-wide debate about nuclear weapons for over fifty years.

This has happened in large part because nuclear weapons are usually not discussed in moral terms. From the very beginning of the nuclear age there has been a tendency to use language that hides the reality of what is being considered But it is more than simple disguise Language is used as an anaesthetic, as a way to kill feelings. Without feelings, morality dies. These are the first casualties of nuclear weapons

Nowhere is this more evident than among those people whose job it is to deal with these weapons on a daily basis. The American scientists who build the first ever nuclear bomb simply called it the 'Gadget', as if it were just another strange invention rather than the most destructive weapon that had ever been made. When it came time to kill people with these weapons, the scientists and soldiers involved found the most innocuous names possible for the weapons: the bombs that destroyed the Japanese cities of Hiroshima and Nagasaki were called 'Little Boy' and Tat Man'.

This refusal to confront the reality of nuclear weapons is not confined to the United States. It has afflicted every state that has developed them The Soviet Union named its first bomb, the 'Article'. Britain called its first nuclear explosion 'Hurricane', France had (he 'Blue Mouse', and China named its first nuclear weapon simply 'Device 596'.

The same escape can be found closer home; India called its nuclear bomb test in 1974, "Smiling Buddha' and more recently simply 'Shakti'. All of these illustrate what psychologist Robert Jay Lifion has called nuclear numbing, the process by which "we domesticate these [nuclear] weapons in our language and attitudes. Rather than feel their malignant actuality, we render them benign."

Pakistan has its way of talking about its nuclear weapons without really talking about them For more than a decade while it lacked a nuclear bomb that it could name, the debate in Pakistan was only about a nuclear option, or a nuclear capability". There was never a mention of what it was an option for. So used are Pakistan's scientists to a nameless bomb that they have not so far given a name to the nuclear tests.

If the nerve of moral outrage is dulled, there is hope that the sharp prick of knowledge can serve to revive it. Laying out enormity of what is involved in Pakistan's nuclear tests can serve this purpose. Pakistan is believed to have tested a simple nuclear weapon of the kind that was used 52 years ago against Hiroshima In Hiroshima, the atomic bomb killed between 210.00 and 270.000 people, and destroyed more than 90% of the city. Pakistan's nuclear tests were a demonstration that it could do the same thing to one or more of India's major cities The city could be Bombay, or Delhi, or any one of nearly half a dozen others That any of these cities would be largely destroyed is obvious What needs to be faced is how many people would be killed Estimates of the deaths that would result from such an attack vary, but each new estimate is larger than the one that came before. An early estimate was that an attack on Bombay would kill between 103.000 and 265.000 people, while 26,000 - 175.000 would die if Delhi were the target. Later estimates suggested there might be 136.000 deaths in Bombay, and more than 220.000 people injured, while in Delhi, the toll would be

40,700 deaths and 66,900 injured. The most recent estimate, based on the 1991 Indian Census, is that as many as 700,000 people would die in Bombay alone. It hardly needs to be added that since almost half the population of India, like that of Pakistan, is under the age of fifteen, about half of all these deaths would of children.

In the final analysis, a nuclear test is about proving you have the power to do this. Becoming a nuclear weapons state, a status both India and Pakistan now claim, means keeping this power. Giving up nuclear weapons means accepting that there is nothing, nothing at all, that could ever justify wanting or having such terrible power,

The experience of Hiroshima should have been enough to convince anyone that nuclear weapons were an affront to humanity. Despite this there has been a world-wide debate about nuclear weapons for over fifty years.

Dr Zia Mian is presently working as a research associate at Princeton University. He is one of the foremost antinuclear activists in Pakistan.
The article is an edited version of a long article to he published in Pakistan and the Bomb - Public Opinion and Nuclear Options, edited by Samina Ahmad and David Cortright, University of Notre Dame Press, 1998

Nehru And Nuclear Conspiracy

Dr. M. V. Ramana

Nuclear programmes the world over are, and have always been, powerful symbols of State power. In the early history of the Indian nuclear programme, the one political figure who figures repeatedly is Pandit Jawaharlal Nehru, India's first Prime Minister.

Nehru's interest in nuclear power as an example of a scientific enterprise is not surprising. Since his early days in England, Nehru was always convinced of the positive good that could result from science. Addressing the Indian Science Congress in 1938, he emphasised his faith in science as follows: *"The application of science is inevitable and unavoidable for all countries and people today. But something more than its application is necessary. It is the scientific approach, the adventurous and yet the critical temper of science, the capacity to change previous conclusions in the face of new evidence, the reliance on observed fact and not on preconceived theory - all this is necessary not merely for the application of science, but for life itself and the solution of its many problems."*

A central canon in science is openness; but secrecy has become the bane of science. Two reasons can be given for this. First, secrecy in science is unethical. Science does not grow by the intellectual activities of individual scientists, or even of a team of scientists. It is the product of the whole community. It is for this reason that one of the greatest physicists of all time, Sir Isaac Newton said : "If I *have seen further than others, it is because I stand on the shoulders of giants. If one takes information from others, then one must also give"* Second, secrecy hides errors and inefficiencies. In the words of J. D. Bernal : *"With no check from publication and free criticism, the most errant nonsense is likely to receive official sanction. Teaching will become an initiation into mysteries, and science will degenerate into the kind of cabalistic alchemy it was in the decay of the Roman Empire The growth of modern science coincided with a definite rejection of the idea of secrecy."*

Secrecy and the Nuclear Establishment

A central canon in science is openness; but secrecy has become the rule in big science and nuclear technology.

The Indian nuclear programme which began by envisioning itself as devoted to scientific research violated this canon from its very inception. During Nehru's reign as the Prime Minister, the Indian nuclear establishment progressively insulated itself from outside gaze. Passed shortly after independence, the Atomic Energy Act of April 1948 made atomic energy the exclusive responsibility of the state. In 1958, with the creation of the Atomic Energy Commission, the nuclear establishment succeeded, in increasing its authority. And, finally, on September 15, 1962, the Parliament passed a new Atomic Energy act that granted the chairman of the Atomic Energy Commission the sole authority to initiate, execute, propagate, and control exploration, plan and manufacture of atomic material and its related hardware and all nuclear research and developmental activities. Under Section 18 (i) of this act, the government was empowered to restrict the disclosure of information, whether contained in a document, drawing, photograph, plan, model or in any other form whatsoever, which relates to, represents or illustrates: a) an existing or proposed plant used or proposed to be used for the purpose of producing, developing or using atomic energy, or b) the purpose or method of operation of any such existing or proposed plant, or c) any process operated or proposed to be operated in any such existing or proposed plant. Section 20 denied any person or organisation not authorised by the A EC to invent or to patent anything which the A EC believes as relating to atomic energy. Section 21 (5) gives the A EC absolute authority over any legal or formal arbitration.

Saha and the Nuclear Establishment

Not only is this secrecy meant to prevent lay persons from knowing what is happening, but also the rest of the scientific community in the country, i.e. outside the nuclear establishment. One of the biggest challenges to the Indian nuclear establishment, and probably the only major challenge to come from the rest of our scientific cadre, came from the famous scientist Meghnad Saha. Saha was an early votary of the application of science and modern industrialised development to India. It has been argued that he may have been one of the first scientists anywhere to realise that atomic energy can be used to generate electricity. Thus, he was certainly not opposed to nuclear energy. What he was opposed to was secrecy and the exclusivity of the Indian Atomic Energy Commission. In particular, he wanted to see universities do research, and be supported in their efforts to do so. on nuclear physics and engineering. During the early 50s. as an elected Member of Parliament, he repeatedly raised this issue on the floor of the Lok Sabha.

Responding to Saha's constant pressure and critiques. Nehru agreed to hold a special conference entitled "The Development of Atomic Energy for Peaceful Purposes in India" on November 26 and 27.1954. For Saha. it was to be a way of addressing the appropriateness of the Atomic Energy Commission's(AEC) strategy. However, the very choice of location - the National Physical Laboratory (NPL) in Delhi - suggested that the die was already cast against him. N PL's director was K S. Krishnan, one of the three founding members of AEC, the other two being Horn i J, Bhabha and S. S. Bhatnagar. In the words of Raja Ramanna, Krishnan would eventually "save the day for us (the A EC)." The bulk of the speakers were from the A EC and the whole conference had the effect of marginalizing Saha and defusing the challenge to the power of the AEC. In his opening remarks at the conference, Nehru clearly defined the technological aspects of nuclear energy as restricted to the state alone though he suggested the possibility that the scientific aspects may be pursued in the universities. All these suggest that Nehru was far from being neutral in his role of arbiter.

Why Secrecy?

While introducing the Atomic Energy Act in 1948. Nehru gave two reasons for the imposition of secrecy: *The advantage of our research would go to others before we even reaped it. and secondly it would become impossible for us to cooperate with any country which is prepared to cooperate with us in this matter, because it will not be prepared for the results of researches to become public "*

To say that the US. Canada, England and so on, from whom we got much of our early nuclear know-how, would steal ideas from Indian research is disingenuous at the very least Further, it is not clear why 'others' should not benefit from our research'. India, after all. was planning to benefit from the results of research carried out by western countries. And. last, if these were to be the only reasons, then the same levels of secrecy should have applied to other fields of science and technology.

The answer, perhaps, lies elsewhere.

> I hope Indian scientists will use the atomic force for constructive purposes. But if India Is threatened she will inevitably try to defend herself by all means at her disposal
>
> *Jawaharlal Nehru*

Nehru and the Bomb

To attempt to understand the reasons for Nehru's support for secrecy in the Indian nuclear establishment, we turn to an early quote of Nehru's dating back to 1946. In a remarkably forthright speech, he said *As long as the world is constituted as it is, every country will have to devise and use the latest scientific devices for its protection I have no doubt that India will develop her scientific researches and I hope Indian scientists will use the atomic force for constructive purposes But if India is threatened she will inevitably try to defend herself by all means at her disposal.''*

This statement reveals several aspects of Nehru's thinking. In 1946 Jess than a year after the bombing of Hiroshima and Nagasaki, it was impossible for anyone thinking about atomic power not to think of its use for defence purposes. But, it is interesting to note that even though India was still a colony of Britain, Nehru envisaged it having potential threats And. implicitly, in stating what India would do in the future, he also seems to see himself as a statesman and leader of the country.

Nehru's understanding of the dual nature of atomic power seems to have stayed with him. Several years later, on a memo submitted by Bhabha, Nehru is also reported to have written a note to the effect that: "*A part from buildtnn power stations and developing electricity there is always a built-in advantage of de fence use if the need should arise.*"

Both these quotes fly against the conventional view of Nehru as one of the foremost votaries of universal nuclear disarmament. Clearly, his activities in the 1950s lends support to this view. All through this period, Nehru was intensely concerned about nuclear disarmament. Being the first to suggest a ban on nuclear testing, he was glad when the limited test ban treaty was signed and welcomed it as a great landmark in history. He also commissioned an official study on the effects of nuclear explosions. Not only did Nehru push for universal nuclear disarmament, but as late as 1961 he had categorically stated in public that India would not produce nuclear weapons "whatever may happen".

As Ashok Kapur points out, there is an ambiguity between Nehru's mistrust of nuclear weapons and his policy of promoting the peaceful applications of nuclear power. Ambiguity does not mean hypocrisy. But, as a leader of a State, Nehru could not perhaps make the choices that he may have chosen as an individual.

This ambiguity is inherent in the whole nuclear enterprise - that something can be developed ostensibly, or even honestly, for peaceful purposes and then put to use for producing weapons. Very early on, this dual nature was explained by Robert Oppenheimer, the head of the Manhattan project that produced the first atomic bombs. In 1946, commenting on a proposal for the international control of nuclear weapons, he wrote : *"We know very well what we would do if we signed such a convention. We would not make atomic weapons, at least not to start with, but we would build enormous plants, and we would design these plants in such a way that they could be converted with the maximum ease and the minimum time delav to the production of atomic weapons saying, this is just in case somebody two-times us; we would stockpile uranium; we would keep as many of our developments secret as possible; we would locate our plants, not where they would do the most good for the production of power but where they would do the most good for protection against enemy attack."*

A few months after Nehru's death, Bhabha pronounced that India was capable of exploding a nuclear device within 18 months. The pronouncement came on the heels of the first Chinese nuclear test. However, given the intricacies involved in manufacturing nuclear explosives, this statement, if true, reveals that much work had been done towards making a bomb even prior to this. The timing also lends credence to the claim that it was Nehru who held back Bhabha's enthusiasm for nuclear tests.

The promised bomb exploded on May 18, 1974 at Pokharan in Rajasthan. The seemingly innocuous choice of words - 'The Buddha is Smiling" - used to inform Mrs. Indira Gandhi, Nehru's daughter and the Prime Minister of India during that period, of the successful explosion is ironical. For, in 1957, during a visit to Japan, standing in front of the Peace Memorial, Nehru said : *"The world must choose between the path of violence symbolised by the atom bomb and the path of peace symbolised by the Buddha."*

The choice is still before each of us.

M V. Ramana

Dr. M. V. Ramana is a physicist presently working as a post doctoral fellow at Massachusetts Institute of Technology in the field of arms control.

Theif ! Who Me?

Pakistani operatives reportedly set up fictitious companesand establishe circuitous shipping routes and smuggling operations to collect equipment, technology and data from the United States, China and European nations Including Britain, the Netherlands, West Germany and Switzerland.

Asked today about the allegations, Khan replied, every project is universal and denied Pakistan stole technology or equipment for its nuclear program. He said countries and individuals were willing to sell technology and material to Pakistan despite what he termed 'unnecessary restrictions, a reference to the laws of some nations that prohibit exporting sensitive nuclear material and technology.

'If somebody selfs it to me and makesome profit how can it be stolen?" Khan asked.

Hey Ram : The Last Shot

Dr Vinay Lal

TThis year, as India marked the 50th anniversary of the assassination of Mahatma Gandhi, the 'lather of the Nation has finally been liquidated. In 1974, less than three years after concluding a victorious war with Pakistan. India exploded what was called a "peaceful nuclear device", as though even its nuclear explosions had to carry some of the burden of Gandhi's non-violence. For the subsequent 24 years, India exercised virtuous restraint, but it has now broken the self-imposed moratorium with a series of five nuclear tests over the last few days. Writing to Clinton and other political leaders, the Indian Prime Minister, Atal Bihari Vajpayee, pointed to the "deteliorating security environment" in South Asia, and the aggressive designs of its two principal neighbours, China and Pakistan, as providing India with a sufficient warrant for seeking to acquire nuclear deterrence. The political party over which Vajpayee presides. which draws some of its membership from other political associations that were implicated in the assassination of Gandhi fifty years ago and which have over been the ardent champions of Hindu ascendancy, has finally removed the specter of Gandhi which has been haunting India's modernizing elite. The Indian nation-state will no longer live in consummate fear of Gandhi's critiques of modernity, big science, instrumental rationality, development, war. and masculinity

While economists, foreign policy experts, and defence specialists will continue to debate the reasons that led India to carry our nuclear testing at this particular juncture, the cost to India of economic sanctions, the possible escalation of an arms race, the palpable failures of American foreign policy and intelligence gathering, and the geopolitical consequences of South Asia's nuclearization, there are other. more interesting and poignant, considerations to which we should be attentive. During the height of the Cold War. Nehru attempted to place India in a 'third camp' and place it at the helm of the leadership of the non-aligned movement. This was even, in some measure, a continuation of Gandhi's policy of repudiating realpolitik. The non-aligned movement, however, would become increasingly irrelevant, until the fall of the Soviet Union rendered it obsolete, and some commentators have consequently interpreted the nuclear tests as India's cry for attention. Clinton appeared to have echoed this view when he noted that India, perhaps lacking in self-esteem, thought itself "under-appreciated" as a "world power".

The history of India's nuclear tests extends back, in a manner of speaking, to the early days of India under colonial rule. The British were apt to describe Indians as an "effeminate" people, leading lives of indolence and womanly softness; following the rebellion of 1857-58, the entire country was divided between "martial" and "non-martial" races. One response was to embrace a certain kind of hyper-masculinity, which would enable Indians to be construed as a people just as "manly" as the British Indians have never been able to live down the taunt of "effeminacy". and those who know of the cultural nuances of South Asian history are aware that some Indians imagine Pakistani Muslims as a meat-eating, virile, robust, and martial race. It is a telling fact that the first comment of Balasaheb Thackeray, the chauvinist leader of the militantly Hindu Shiv Sena party who is an open

Goodbye Gandhi

Fifty years age we took leave of Gandhi
For he was a symbol of the moral power of the nation.

Seeing us at fault
He would cry "Halt"
While returning a debt,
he wouls calculate not
what use the neighbour would make of it.

Being freed of debts
he would try to be righteous

when we opposed the NPT
our theme was righteouness
with what face were bundles upon bundles to desist
while armed with bundles upon bundles of bombs.

The first principle with bundles upon bundles of bombs.

before holding a mirror to others.

when we turned away from CTBT
There were still some sheads of virtue left
what is the point of merely banning testing
while doing nothing about stockpiling

and refining never weapons.

Fifty years!
Today we present you Operation shakti
Having bid a final goodbye to neeti

what strength is there where there is no life
what shakti is there where there is no Neeti

Narayan Desai

Translated from the original Hindi by surendra Gadekar admirer of Hitler, upon hearing of the tests was, "We have to prove that we are not eunuchs."

By signaling its departure from the body of world opinion, India has sought to arrive on the world stage. It is the one resounding cruelty of our times that no nation-state which refuses to partake in realpolitik and the brutal zero-sum politics of our times can receive much of a hearing. The recent nuclear tests may represent the shallow triumph of India as a nation-state, but they signify the saddening defeat of India as a civilization, an irony made all the more bitter by the posturing in which Vajpayee's Bharatiya Janata Party engages as the vanguard of "Hindu civilization". True bravery and courage consist, not in an empty renunciation of what is not possible, but in forsaking the military force that one has at one's command. Thus might what Gandhi called "non-violence of the weak", which is no non-violence at all, be transformed into "non-violence of the strong", and from India's descent into nuclear madness might some good emerge.

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Making Money The Nuke Way

When Tensing Norkay and Edmund Hillary 'conquered' Mt. Everest in 1953, I was just six years old. Yet I remember the excitement. The highest mountain in the whole world had been laid low through human ingenuity, dedication and hard work. After their return from the top of the world, Hillary and Tensing were deservedly treated as heroes. They were just about everywhere, on the covers of magazines and in radio broadcasts.

Leave aside names, can you recall just how many people climbed Everest last year? Or the year before? I wonder if anybody can except perhaps the keeper of records at the Himalayan Mountaineering Institute. The total number who have been there by now must be running into hundreds though it is still probably less than the more than 2000 nuclear explosions that have been conducted in scores of places all over the world so far.

Not that climbing the Everest is a cakewalk. I can't do it even on a bet. But still as far as recognition for achievement goes Everest isn't Everest anymore. And rightly so, because human spirit recognises no boundaries — No ultimate pinnacle.

That is why the spectacle of Dr Abdul Kalam and Dr R. Chidambaram being feted like Tensing and Hillary is so strange and amusing. It is not a symbol of our scientific sophistication that it is made out to be but rather of our scientific naivette and ignorance. After all the first thermonuclear test took place on November 1, 1952, that is a few months before the first ascent on Everest.

One can understand the eagerness of the political establishment to bask in the reflected glory of this 'scientific achievement'. They have other more sinister agendas to accomplish and all the Jai Vigyan euphoria will come in handy.

But what of the scientists themselves? Wasn't it their duty as scientists to use the opportunity presented by being in the focus of national attention to help in the creation of a scientific temper? The first step in such an enterprise would be to make realistic assessment of what had been achieved and a clear enunciation of further goals. That would have at least cooled the hysteria, maybe even saved some blood for uses better than as a substitute for ink! Instead we have interviews claiming that three simultaneous tests were some kind of a "world record".

Besides being in questionable taste, these claims are just not true and salvo explosions of the kind that India conducted were the norm rather than the exception in both Soviet and US testing programmes. The Soviets in fact once conducted eight explosions simultaneously for all the good it did them in terms of "national security".

Why so much hype? The scientists may not be the supermen they would like to project themselves, but neither are they fools They do realise that inflated claims diminishes their credibility in the world scientific community. But they are willing to pay the price for a purpose. And that purpose as always is money. Lots of money.

Recall the situation before May 11, 1998. The nuclear establishment stood discredited. Accidents like the fire at Narora. the flooding of Kakrapar and the collapse, (sorry delamination) of the dome at Kaiga had delaminated their claims of safety. The performance or rather the persistent non-performance of the reactors had put nine out of ten reactors in India, amongst the fifty worst reactors world wide. Funding for nuclear projects was declining and so was the clout of the nucleocrats in corridors of power.

And then suddenly five flashes in the desert and the frog has turned into a Prince Charming sweeping the country off its feet and into a fairyland. All dreamlands in kaliyuga charge hefty admission tickets. No! old nucleocrats assure us. the price is cheap Only Rs one crore per bang. For a country where thousands of crores get swindled in scams every other year such a claim might seem a ridiculously low price to pay for the security of sleeping well at night knowing that your nuclear weapons were out there deterring their nuclear weapons from coming and frying you to a crisp.

We have been down this road before. In the early years of independence Dr. Bhabha using his considerable public relations skills had overcome the opposition of scientists like Dr Meghnad Saha and manipulated the political establishment towards the dead end of the peaceful atom black hole.

What was implied was that more than half the total research budget of the country being invested into the dream of too cheap to meter and plentiful nuclear energy

Besides, the dream also demanded that there be no bureaucratic interference or oversight of any kind. The cloak afforded by secrecy, in the name of national security could be used to cover multiple sins like corruption, non-performance and just plain rubbish science.

By skilful manipulation of the eagerness of the political leadership to play a big brother role with 'big bombs', nucleocrats hope to bring back those bygone days.

It is for the scientists of sense to get together and prevent this hijacking. Indian science cannot afford a second shot in the foot

Surendra Gadekar

THE BANALITY OF EVIL

Achin Vanark

The small and angry minority of anti-nuclearists in India can take some solace from the fact that they are needed now more than ever. They represent the other side of an ongoing discourse and will be around as long as nuclear weapons remain on the face of this earth or that earth itself becomes no longer humanly habitable. The political folly of taking this decision to go nuclear is something that I have been arguing in numerous ways for over a decade. There will be occasion to do so many times again, especially when the shadow of the Pakistan bomb falls on those who can currently only see the 'glow' of the Indian bomb. Here I wish, for a change, to focus on that dimension which has been utterly and contemptuously disregarded by all who supported the testing-the moral question.

The universal glorification of this 'scientific achievement' and the congratulations from all quarters showered on the scientists responsible is nothing less than obscene. Many greater scientists possessing moral courage and integrity of a much higher order, will simply be appalled. Those of the past like Einstein and Oppenhiemer who were horrified by what their endorsement of, and association with, the production of the first atomic weapon had done, and spent the rest of their lives opposing this new evil, will now be turning over in their graves. So sensitive were they to the unique evil represented by such weapons that they insisted not only that what they had earlier justified (needed to fight Hitler) was wrong but that any future production of such weapons be it in the name of national security, or whatever, could never be justified. Joseph Rotblat. recent Nobel prizewinner, simply walked away from the Manhattan Project. Indeed, as they pointed out. if the scientists of the world exercising an independent moral conscience simply refused to make such weapons for their political masters, the world would be free forever of such evil

> The universal glorification of this 'scientific achievement' and the congratulations from all quarters showered on the scientists responsible Is nothing less than obscene. Many greater scientists possessing moral courage and integrity of a much higher order, will simply be appalled. Those of the past like Einstein who were horrified by what their endorsement of, and association with, the production of the first atomic weapon had done will now be turning over in their graves.

A starry-eyed idealism one might say? Once the first bomb appeared other countries fell compelled to do the same One cannot as strongly blame later scientists for not all having the same moral courage as these scientists-dissidents or for doing as they were told by their political masters. This is true enough, and condemning the scientists responsible for carrying out these Pokhran tests is misplaced and not what is being called for The issue is the obscenity of glorifying this supposed feat and claiming it to be a scientific accomplishment worthy of evoking national pride. One could have understood it if the supporters of this testing had said that they were fully aware of this moral dimension but that it had to be subordinated to national security considerations. Or that they were forced to produce these weapons because of the threat possessed by others and therefore had to misuse national scientific capacities (as others had earlier done) to produce them. Or that they grieved because instead of using our wonderful pool of scientists and their skills for truly worthwhile endeavours they had to be wasted for producing something which is so evil by the very nature of their being weapons of mass destruction that they must never be used!

One is not demanding here, that those who supported these tests withdraw their support. On the contrary, one is asking the question why not one politician, not one party, not one strategic expert, and so few journalists among all those who supported the stand of the Indian government could nonetheless not even think of making the only honest and accurate characterisation of the relationship between science and nuclear weapons! To have refrained from praising this misuse, to have called it an unfortunate, even if necessary, abuse of science and scientific knowledge and skill would have been to exhibit a real moral sensitivity and balance, to recognise the distinctive dilemmas posed for any country which decides to go in for such weapons and for anybody who rationalises such possession. The view that this act deserved to be praised as a scientific 'accomplishment' was so widespread and so 'natural' that to think otherwise was made to appear immoral and unpatriotic! What an incredible state of affairs and what a statement of the moral character and fibre of our strategic and political elite and of their upper and middle class supporters! Most of them at least, unlike the more perplexed poor, cannot be accused of not knowing what kinds of weapons these are.

And yet the view that anti-nuclearists are morally superior people to pro-nuclearists is simplistic and inaccurate. The problem is more fundamental and frightening. It is not because people who are more morally insensitive than others will somehow naturally gravitate to being pro-nuclear but the other way around. Ordinary people who are naturally moral and sensitive are made much more insensitive by accepting the ideology and practice of nuclearism. The immorality is built into the very nature of nuclear strategic discourse and practice. Nuclear deterrence is a deeply immoral doctrine. The defence of it is always immoral. Persistent involvement in this discourse debases a nation, above all the nuclear elite and its support base. Moral hypocrisy cannot be avoided. It gets institutionalised and repeatedly surfaces over a whole range of arguments, claims and policy postures. There is the hypocrisy of claiming that nuclear arming by a 'good' country will promote nuclear disarmament and, of course, all national nuclear elites regard their own country as 'good'. A more recent hypocrisy will be shown by those in India who screamed that the NPT and CTBT discriminate between nuclear haves and have-nots but will now say India should sign these as a nuclear weapons state. The NPT is discriminatory, the CTBT is not, but let us leave that aside for the moment. Terrible as it is, the central issue is not the moral hypocrisy of nuclear strategic discourse. Nor is it even the strategic and political incoherence of nuclear deterrence thinking Now that more people will be forced to think more seriously than ever before on this issue, the strategic-political dividing line will be between those who continue to believe that such deterrence works and those who recognise that it is incoherent, self-contradictory and degenerative in the logic it imposes on the relations between hostile, nuclearly equipped rivals - hence an unavoidable arms race and growing nuclear tension.

It is another inescapable dilemma that is the crux. The pursuit of national nuclear security is simply not compatible with the pursuit at the same time of universal global disarmament. Some pro-nuclearists pretend to themselves and others that it is. The more straightforward of the pro-nuclearists have simply said we can never have complete global nuclear disarmament which is a mirage. However, it isn't. Humans have the capacity to undo this unnecessary evil but to do so they have to abandon the political stupidity and the immorality of deterrence thinking. As long as it holds we are doomed to having the shadow of the nuclear holocaust always upon us. We will not move towards total disarmament through notions of proportionate disarmament so that 'security deterrence' is always presumably maintained till all the nuclear weapons states simultaneously reach the point of complete disarmament. The moral breakthrough has to come first-to think differently and reject deterrence-in order to make the political breakthrough towards institutionalising an irreversible process culminating in total disarmament.

Einstein pointed out the dilemma long ago-" the coming of nuclear weapons has changed everything but the way we think." Moral commitment, integrity, and courage are the need of the hour and the struggle to realise these values is the only way to overcome our fundamental evils be they apartheid, colonialism or nuclearism. The growth and spread of pro-nuclearists reflects the triumph, through banality, of evil

Achin Vanaik is an antinuclear activist and a political commentator based in Delhi

Pound of Flesh

Finance Minister Yashwant Sinha began his maiden budget speech by stressing that the Pokhran tests were the 'first step" towards building a new, strong and self-reliant India." Plan allocation for the Department of Atomic Energy (DAE) in the budget has been inceased by a hefty 68 per

Protest and Survive

In this issue of Anumukti we have argued that the nuclear debate is immoral But having said that one cannot shirk the challenge to debate. For it is a debate for the very soul of India and Pakistan Despite what pusillanimous mainstream political parties in both countries think, permanent mutual hostility requiring ever sophisticated and destructive armaments is not the only possible state of being.

Despite the moral argument against nuclear weapons, in the states that have built these weapons there has been public support for them. This public support has been built by creating a sense of crisis and fear. People are told that there is an enemy and the bomb is the only defense. In an atmosphere of absolute conflict, peace is ruled out.

There is also no doubt that the overwhelming elite support for nuclear weapons in India and Pakistan is shared by large numbers of ordinary people Nationwide celebration of nuclear tests in both countries is sufficient to prove this This level of support, according to opinion polls, has not changed for over a decade. This is remarkable. In one of the most tumultuous periods in the region's history, where governments came and went, economic policies changed, the Cold War ended, the Soviet Union collapsed, sanctions were imposed on Pakistan because of its nuclear weapons programme, nuclear weapons have remained beyond question.

There are two reasons behind this massive and inert support for nuclear weapons. The first is that most people know little if anything about nuclear issues This is an obvious inference from polling data showing that support for nuclear weapons in both countries is constant regardless of educational attainment From the illiterate to those having only a basic education to those with degrees, about the same proportion of them support these weapons. There is rarely such unanimity except w hen based on a shared ignorance. In the absence of information, there is no incentive to change one's mind. There is. indeed, no reason to even think about changing one's mind.

That the nuclear debate is starved of information is evident, one only has to look at newspapers, magazines and electronic media. There is never more than assertion that nuclear weapons are vital This is the second reason for the strong and enduring support for nuclear weapons For over a decade, the people have had heard nothing but repeated public declarations by all sorts of political and military leaders that nuclear weapons were vital for the national interest When things are presented in this way it is evident that many people will conclude nuclear weapons are the last and only hope

But nuclear weapons need enemies to make them worthwhile For decades, India and Pakistan have been projected as absolute and unremittingly hostile enemies, without scruple, willing to exploit every opportunity. The other is the source of everything that goes wrong in Pakistan and India. Any challenge to the status quo is interpreted as a foreign inspired conspiracy against national security

The final and darkest element in manufacturing a national consensus in support of nuclear weapons is maintaining ignorance That it is at work can be seen in the deliberate orchestration of hate by sections of the media against individuals and groups who argue against nuclear weapons Debate that might inform people about alternative ways of thinking is not only discouraged, it is not tolerated

An example from each country should suffice.

Letter from Dr Zia Mian
"I have received serious and disturbing news from one of my closest friends in Pakistan. Dr A.H Nayyar (Associate Professor of Physics at Quaid-i-Azam University in Islamabad). Nayyar, is one of the handful of real peace activists in Pakistan, and has been among the most significant and active during the horrors of the last few weeks

> *The hope of intellectual independence is to resist, and the necessary first step in resistance is to discover how the institutional grip is laid upon our mind.*
>
> ***Mary Douglas***
> ***How Institutions Think***

"At a press conference today (June 2. 1998) organised in a hotel in Islamabad by the Pakistan-India Peoples Forum for Peace and Democracy. A.H Nayyar. Fqbal Ahmad and Samina Ahmad (no relation) were supposed to talk about the current nuclear crisis in South Asia

'About 50-60 journalists attended the press conference and most were hostile Instead of questions from the floor, there were long inflammatory statements attacking the speakers. Then 10 to 15 young men belonging to Shabab-e-Milli (the youth wing of the Jamaat-i-Islami, a right wing Islam ist Party) burst in with banners and placards denouncing the speakers. They then started to shout slogans. A journalist, who has demonstrated his hostility towards peace activists on earlier occassions (most notably at a public meeting held in Feb 1996), attacked A.H. Nayyar. The Shabab-e-Milli members joined the attack. In Nayyar's words "I got a good beating by fists, kicks and chairs, but suffered only a few minor bruises." Some of the other journalists intervened, at which time the speakers were escorted to a safe place by the hotel staff. After the meeting, some of the journalists were also beaten up by the Shabab members.

The first victim of nuclaer weapons is always conscience,

Zia Mian

Letter from Shri Bhanu Das

"At a meeting organised by Peoples Union for Civil Liberties (PUCL), Congress for Democracy and Centre for Education and Documentation (CED), I had been invited to speak as a physicist and a democratic rights activist, but I had to turn down the invitation as I was one of the principal organizers of another meeting at the same time. Two of the speakers, A.K.N.Reddy, an expert on energy studies and Hasan Mansur from PUCL are retired academics. The audience was made up of primarily academics and intellectuals. The Hindu Jagaran Vedike an RSS front, decided to target this meeting. The RSS storm troopers actually prevented the meeting from taking place for a while. Some of the people in the audience told me that they were on the verge of being physically attacked by those goons. The organisers had to call the mobile police to resume the meeting. Indeed the RSS which had been quiet for the last few years is now beginning to show its true colours. The message to me is clear—the fight against nukes in India is inextricably linked to the fight against Hindu communalism.

Bhanu Das

'Secular' Hindus seem to have given up the fight for the Hindu mind by default. Today we have a strange doctrinal and intolerant masquerade of Hinduism promulgated by the likes of Vishwa Hindu Parishad and Bajarang Dal as the dominant face of 'resurgent' Hinduism. It is imperative to realise that one needs to fight not to loose the "patiriotic" space by a similar default.

Therefore, news of protest meetings and actions from different parts of the country and even from the Indian diaspora in other countries in which a few hundred people each have participated are so welcome. Mainstream newspapers have downplayed such events by giving them only local coverage. That is why there is dire need for better communications between these spontaneously arising groups in different parts of the country. More concerted action will not only educate the people regarding the truth about nuclear weapons it will also send a strong political message to the people who have perpetrated this outrage that it is not all gain no pain. There is a domestic political price to be paid for reckless adventurism.

Surendra Gadekar

Reports of Protest Actions from Horn e and A broad

Below we give a summary of some of the reports that have come to us from friends about these actions. Some of the countries leading intellectuals and prominent citizens have participated in these programmes. No doubt there have been other events in other towns and cities in the country from where we have not received any reports.

Protest Against BJP's Despotic Designs

Payyanur,May 16,1998

The Peringome Anti-nuclear Forum strongly protested against the nuclear tests at Pokhran. Hundreds of activists took out a procession at Payyanur town on 16.05.98 shouting slogans. Later a largely attended public meeting was held at the bus stand square in which Dr. D. Surendranath, Mr. N. Subrahmanyan and Mr. K. Ramachandran spoke. The speakers held that the BJP Govt., by harping on chauvinistic national sentiments and directing people's ire against neighbouring countries, was trying to promote hatred and jingoism. They condemned the militraisation of the Asian region and warned against an escalating nuclear arms race. Any nuclear programme, either for 'peace' or for war, cannot promote national security or general welfare; on the contrary it can promote secrecy, mutual suspicion and despotism.

Students, Teachers Form Solidarity For Peace

Hyderabad, May 23,1998

Leading academic, intellectuals, human rights activists, journalists and writers from Andhra Pradesh have condemned the recently conducted nuclear tests describing them as 'anti-people' and indicative of the fascist designs of the Bharatiya Janata Party-led government. Presiding over an anti-nuclear weapons conference, organised here last night by Solidarity for Peace, a forum of students of the Hyderabad Central University Prof G Haragopal, vice-president of the Andhra Pradesh Civil Liberties Committee (APCLC) and head of the human rights department of the university, said going nuclear would only lead the country to greater centralisation of powers in the hands of politicians, technocrats, bureaucrats and security forces and pauperise, subjugate and render helpless the common people. A PCLC president M T Khan, speaking on the social political and cultural fall-out of the nuclear tests, quoted Prime Minister Atal Behari Vajpayee's statement that we would sacrifice every thing for the country's security. "What it means is that the BJP would sacrifice human rights and dub any people's movement, dissent and struggles for life as anti-national." he added. Mr Khan said the jingoism of the BJP leaders suited politicians of Pakistan equally as the cry of patriotism would help them repress any form of dissent Prof Rama Melkote of Osmania University questioned the propriety of the state assuming monopoly over violence and weapons and pointed out that internal security of the state was as important as external security. She said nuclear weapons cannot ensure the security of the country, pointing out the case of the former Soviet Union, which despite having a large stock of nuclear weapons, collapsed under its own weight. She said the welfare of the people and integrating them were a greater guarantee for the security of a country. Leading environmentalist Purushottam Reddy wanted a total ban on nuclear establishments in the country. Prof S G Kulkarni condemned the militarisation of science and technology and stressed the need for advancement in science and technology for solving the problems of the people. He alleged that the ruling party leaders and technocrats were hand in glove in nuclearising the country which would only promote a dictatorial government which took shelter behind secrecy. Prof Probal Dasgupta said there was nothing to gloat about the nuclear tests as our scientists had only duplicated the technology available elsewhere. A PCLC general secretary K Balagopal called upon all the concerned citizens to launch a campaign to concientizc mass opinion against nuclearisation.

Indians, Pakistanis Protest N.Tests

Montreal June 13, 1998

"For a lasting peace in South Asia!" "No to nuclear tests^0 Raising these slogans, a group of about 100 demonstrated in Montreal

The assembly was called by the South Asian Women's Community Centre (SA WCC) and CERAS (Centre d'etudes et recherches sur Pasie du sud). SAWCC is a service, support and advocacy organization for South Asian women and their families in the Montreal area. CERAS is a nongovernmental organization which works with grassroots organizations in Pakistan, India, Bangladesh, Sri Lanka and Nepal in the areas of development, gender, health, peace and secularism A third of the group were of Pakistani origin, another third were of Indian origin and the rest were individuals concerned with peace. The demonstration commenced to the strains of "Sangam' the collaborative effort of Pakistan's late Nusrat Pateh Ali Khan and India's Javed Akhtar.

During the demonstration, various individuals spoke Naushad Siddiqun. Humeira Iqtidar and Dolores Chew denounced the tests. They also said that the nuclear club of five, including the United States, had no right to hypocritically criticize India and Pakistan, while they maintained a nuclear arsenal and carried out tests themselves Dolores Chew said that the tests had generated nationalistic fervour in India and Pakistan In India this w as the deliberate intention of the BJP goverment, in its bid to garner wider support by diverting attention from their fundamentalist past and present.

The demonstrators were informed of an attack on Dr. A.H. Nayyar of the Pakistan-India Peace Forum by the Shabab-e-Milli in Islamabad, Anand Patwardhan, internationally-renwned documentary filmmaker and 200 others belonging to the Anubam Virodhi Andolan. who were demonstrating in Bombay, were lathi-charged by the police who invoked See 144 Many were also, arrested. In Bangalore, a meeting of scientists was disrupted and broken up by BJP supporters

Those assembled wanted to send a strong message to the governments of India and Pakistan that as non-resident Indians and Pakistanis they could work together and support peace initiatives that had begun under the previous Indian government and were being galvanized at the grassroots by the Pakistan-India Peace Form

Convention A gainst Nuclear Weapons

New Delhi, 9th June, 1998

In a rare expression of unanimity, eminent speakers from diverse walks of life unequivocally condemned the BJP-led Governments decision to conduct nuclear tests, at a Convention organised in New Delhi on 9th June. The Convention was attended by over 400 people representing academicians, scientists, defence experts, journalists, lawyers, artists and leaders of political parties.

Prof. Rajni Kothari, in his opening remarks as Chairperson of the Convention, said that the Government had resurrected the prospect of Armageddon. He said that the whole concept of viewing nuclear weapons as instruments of deterrence was morally abhorrent and dangerous. The Indian Government's action may well accelerate the global arms race. He expressed his apprehension that it was actually the RSS which is running the present Government, and the explosions at Pokhran should be viewed in the context of the RSS's quest for dominance. This, he felt, made the tests doubly dangerous, as nuclear weapons in the hands of a RSS run Government is fraught with far greater dangerous consequences.

Sri N Ram, Editor of Frontline, termed the tests as "Right Wing adventurism of the most dangerous kind" which would "profoundly affect the terms of the nation's engagement with the region and the world". He said that the tests and subsequent "sabre-rattling statements" by ministers had led to the internationalisation of the Kashmir issue. He felt that there are clear signals that the Government's position would rapidly move from one of adventurism to appeasement and even surrender towards the interests of Imperialist powers.

In an evocative and emotional address Admiral Ramdas (former chief of Navy) said that the aftermath of the Pokhran blasts, in some ways, marked a "turning point in his life". He described himself as a person who had spent 45 years of his life in uniform and one who had been an integral part of policy formulation in defence related matters. He was deeply disturbed at the turn of events and said that the tests have "cast an evil shadow over the sub-continent". He categorically stated that no matter what the compulsions were, there was no justification for India deciding to go nuclear. He said that as a career defence person he could visualise how. "so many things can go wrong with nuclear weapons", leading to a disastrous nuclear conflagration. Instead of enhancing national security, Admiral Ramdas felt that the Governments action had only enhanced the threshold for the possibility of things going wrong. Nobody really had a clue, he said, about the implications of a nuclear weaponisation programme, for Command and Control systems. Who, he queried will have his fingers on the nuclear button—the Prime Minister, the Army Chief, the BJP Chief or the RSS? He dubbed the pronouncements by ministers as those of "babes in the wood who had found a new toy" and apprehended that a nuclear holocaust was a real possibility. As a result of an accelerated arms race, the people would have to pay the penalty in the form of cuts in expenditure on Health, Education and other Social Sectors. He said that it was imperative for India and Pakistan to get together immediately and put a cap on their respective nuclear programmes. He said that "we are all fighters here, and we need to fight for peace", and get the public in both India and Pakistan to understand about the disastrous consequences of a nuclear conflict so that they can pressurise their respective Governments.

Dr.Ashok Mitra said that he felt ashamed as an Indian after the tests. Drawing a parallel with the demolition of the Babri Masjid in 1992. he said that the tests were an attempt by the BJP to create a frenzy in order to divert the attention of the people from real issues. He said that India and Pakistan, in an accelerated arms race, can exhaust their national incomes but would end up in merely maintaining the same levels of relative defence preparedness. By exploding the "swadeshi bomb" the BJP Govt, had actually opened the floodgates for foreign domination over the economy. Foreign banks and companies are now to be allowed to remit their earnings unfettered to their parent companies. He was afraid that the South East Asian syndrome—where foreign speculators played havoc with domestic currencies— may now extend to South Asia.

Dr.T.Jayraman (Indian Instt. of Mathematical Sciences, Madras) and Dr.Satyajit Rath (National Institute of Immunology, Delhi) decried the attempts to use patent falsehoods and half truths as scientific arguments, in order to justify the "inevitability" of the nuclear tests by India. They felt that much of the debate on the issue has been ill-informed and has failed to focus on the real effects of a nuclear war. Dr.Jayraman said that the DAE and DRDO were party to the overturning of the national consensus against exercising the nuclear option. He said that India's scientific capabilities have little to do with its ability to conduct nuclear explosions He said, for example, it takes a much higher degree of S&T capability to maintain a satellite in geostationary orbit to augment communication facilities, than to produce a missile with a nuclear warhead that can accurately reach its target.

Prof. Prabhat Patnaik, in an incisive attack on the tests, termed them as an "astonishing act of stupidity". He felt that the tests and their aftermath will be used by the Government to accelerate the neo-liberal thrust of the economy, where we shall see MNCs lording over the economy. He saw in the nuclear tests another move in the direction towards "disenfranchisement of the poor— politically and economically", A typical way, he felt, of a fascist political formation trying to establish its hold over the country. He said that there has been a major move by fascistic forces to manufacture a "popular mood" in favour of the Government's policy. He said that the need of the hour was not to "kowtow" to the so called popular mood but to stand n clear opposition to the diabolic designs of the BJP Government and its cohorts.

Prabir Purkavastha

The Threat of Accidental Annihilation

Peter Feaver

Most public analyses of the South Asian nuclear standoff have focused on the dangers of an arms race and the possibility that one side will launch a surprise attack to settle (he Kashmir problem. These are serious concerns, but they are not the biggest danger.

Arms races are expensive and wasteful, but they are rarely dangerous in and of themselves....

Rather, the biggest danger in the new situation is the uncertainty over how safe and secure the Pakistani and Indian arsenals will be against accidental and unauthorized use. In other words, what we really should worry about is that India or Pakistan might find themselves "using" the weapons whether they intended to or not.

Accidents can happen because the design of the nuclear weapon itself is faulty or because the systems and procedures used to launch or drop the weapons lack safeguards. Unauthorized use can happen if those who are tasked with using the weapons under authorized conditions have the ability to use them regardless of whether they are given an authoritative order.

All arsenals contain inherent risks of accidental or unauthorized use because it is expensive, difficult, and sometimes impossible to avoid risks without rendering the arsenal itself unusable under appropriate circumstances.

A nuclear command and control system that is optimised for use under authorised conditions is, of necessity, a system prone to accidental or unauthorised use. A system optimized against accidental or unauthorized use runs the risk of not being available for authorized use, especially after suffering a surprise attack.

This is the nuclear surety problem: making sure weapons are always ready for use when needed, but never detonated accidentally or by unauthorized personnel.

Not Just Academic Scare-Mongering

At 02:26:00on 3rd June 1980, at Offut Airforce Base in Nebraska the alarm went off on video screens used to track path of incoming missiles. Two Soviet SLBMs were inbound from North Atlantic.

In addition to calling the Pentagon for more information, the controller also alerted bomber and missile crews. *The incoming missile counter was clicking up missile tracks so fast that within seconds, hundreds appeared to have been launched. NORAD duty officers searched their independent early warning system for some confirmation of the attack. When none was found, controllers held a threat assessment and agreed the problem was a fauit in NORAD's computer relay system. The alert ended 02:29:12 It had lasted three minites and twelve seconds.*

Unlike the more than half hour flying time for missiles between! the US and Soviet Union, the flying time for missiles in the India-Pakistan theater is likely to be less than 7 minutes. We need to have fool proof and MilwOrm proof computers and technicians not only in India but Pakistan as well to escape accidental annihilation

There is a silly theory fashionable in some circles that we don't need **to** worry about this. Pakistan and India w ill worry about nuclear surety themselves, optimists aver, and will naturally solve the problem.

Such wishful thinking shows astonishing ignorance of US and Soviet nuclear history. The Cold War record of numerous near-accidents and close calls proves that military establishments will tolerate extraordinary risks of accidental and unauthorised use to ensure the weapons will be available for deliberate use, if needed.

These near-accidents were the direct result of compromises made on nuclear surety questions. Tolerating the risks of airborne alerts to achieve a maximum show of force here, failure to install nuclear safety devices for fear it would unnecessarily complicate a launch under duress there

This is the root nuclear dilemma Although a nuclear surprise attack is a very unlikely scenario, it is one against which military planners must prepare. To prepare against it. they must take steps that increase the likelihood of accidental or unauthorized use

Continued on page 17

New Meanings for Commonly Understood Old Words

M. V. Ramana

India's now famous linkage between nuclear testing and the birthday of the great apostle of peace, Gautama Buddha, reflects not only political crassness but also a propensity to find hypocritical intcipietahons toi noble sentiments Indulging in such double-speak is just another affirmation of India having internalized the forms of thinking and expression prevalent in the gang of nations that lead the way in terrorizing the world with their military arsenals -De the nuclear weapon slates

Nuclear Disarmament

When speaking of nuclear matters, it there is one phrase Indian officials use more often than nuclear weapons, it must be nuclear disarmament India had a time-bound plan for nuclear disarmament, the CIBT did not lead to nuclear disarmament and everything we were doing was to promote nuclear disarmament

Bogically, therefore, in the full official press statement following the tests, the statement "India remains committed to a speedy process of nuclear disarmament" had to be included It was

Two days later two more tests were conducted Evidently the Indian government thinks that commitment to nuclear disarmament means conducting nuclear explosions at a speedy pace

Some what like a habitual drunkard who thinks that the way to abstinence is by quickly finishing the bottle

Nuclear Status

Soon after these tests, Prime Minister Vajpayee announced that India had declared itself a Nuclear Weapon State (with a big bomb) This was a rare moment of truth, though for many of us an unpleasant one Now, thankfully, analysts in the United States can stop coming up with new adjectives to describe India's status threshold nuclear state, de-facto nuclear weapon state, nuclear-capable state, and so on Neither do they need to apply these terms to Pakistan Now Israel remains the only state with more than 200 'ghost bombs'

Nuclear Weapon

However, Vajpayee followed this statement with a new interpretation of the role of nuclear weapons in international affairs He said, "ours will never be weapons of aggression ". This is a complete perversion of history Nuclear weapons are quintessentially weapons of genocide The 'big bomb' that India now has can kill, in a matter of instants, hundreds of thousands of people, and many more in the years that follow No State invests huge amounts of resources to produce them if it never plans to use them The question is not whether they are used first or in response to someone else's use In either case, an act of aggression - killing innocent civilians-will be conducted And, the Prime M mister's statement the follow ing day - that India will not hesitate to use nuclear weapons if its defences were threatened - makes it amply clear that these bombs are intended for use

World's Largest Democracy

By going on from one momentous decision to the next at breathtaking speed, the BJP government has also given us a new definition of democracy The history of a nation of nearly a billion people, and in all likelihood the histories of the neighbouring nations as well has been changed by decisions made literally by a handful of people Plans for the test are believed to have been known only to the Prime Minister, the defence minister George Fernandes, principal secretary to Prime Minister, Brajesh Mishra, political adviser Pramod Mahajan, scientific adviser to Prime Minister A P J Abdul Kalam, and Atomic Energy Commission chief R Chidambaram This follows well in the tradition of the 1974 test Then the decision to test was

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Bulk orders for both the spedal issues on bomb testing can be placed at the same address at a believed to be known only to Mrs Indira Gandhi, her principal secretary P N Haksar, secretary P N Dhar, B D Nag Choudhury, Atomic Energy Commission chief H N Sethna.and Raja Ram anna, leader of the team of scientists that carried out the test at Pokhran

CIA Disinformation Campaign

The BJP is, of course, a past master in the art of redefining words. No one could have forgotten how the party. b> forcefully demolishing the Babri Masjid, found new interpretations for secularism and communal harmony. Not to be outdone in this pursuit are the various other political parties that have had an equal hand in determining India's nuclear posture.

As is now amply clear, the assertions by the Congress Government in 1995 that they were not planning any nuclear test were simply false. Also false was the assertion reprinted dutifully in a number of newspapers all of whom prefer to 'patriotically' pass on government handouts, that this was part of a "CIA disinformation campaign''.

Gujarat Doctrine

The former Prime Minister himself admitted styly that test preparations had been going on during his tenure with the statement, "You can make out whatever you want to know from the fact that a nuclear test cannot be done overnight."

By and large, opposition parties have stuck to mealy-mouthed responses and trying to protect their own patriotic credentials by congratulating our scientists profusely. At best they have questioned the timing of the tests and the right of a minority government to take this decision. These are valid questions indeed. But, they stop way short of any comment, critical or otherwise, about the tests themselves.

This is not surprising. During the CTBT debate, they were falling over one another in defending India's nuclear option against "western treaties" Having done that they have boxed themselves into a corner, where they could not really question the tests in any meaningful manner.

Peaceful Uses of Atomic Energy

The scientific establishment, particularly the Department of Atomic Energy, by testing a range of sophisticated weaponry has shown that our "peaceful nuclear programme" has been busy reinventing the meaning of the adjective peaceful. Once again, we have to be thankful that they did not further denigrate that term by calling these tests peaceful nuclear explosions

Great Power

There is another sense in which declaring India a nuclear weapon state may reflect an uncomfortable truth The current five nuclear weapon states have been the biggest bullies around.

They have used their nuclear weapons on numerous occasions, not by dropping it but by threatening to drop them *on* those opposing their will. The US. of course, leads the pack both in terms of the number of threats it has issued, and by its heinous attacks on Hiroshima and Nagasaki.

By its repeated demands to be recognized as a great power, and making it clear that by power it meant the kind of power that the five nuclear weapon states have (and not for example, the kind of monetary power that Japan and Germany have), or the moral influence India used to have in the early days *of* independence. India has also shown its own desire for this role

The nuclear weapon states, of course, do not want to have India join their club. They argue, quae hypocritically, that they, and they alone, have a need for (and a right to) these genocidal weapons It is sad that when faced with this hypocrisy, India has decided to join them rather than fight them Bytaking the high moral road *of* abstinence. or now. renunciation, it could lead the way to a nuclear weapon free world. The chances of that, unfortunately, are low

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Accidental Annihilation

Continued from page 15

During 50 years of Cold War experimentation, the United States and the Soviet Union adopted technical fixes like coded-locks buried inside the war head and administrative measures like the two-man rule. These steps went far to reduce the nuclear surety problem

Indeed, ongoing concerns about nuclear surety, not fears of an arms rate or of deliberate use, arc the primary impetus behind recent proposals to reduce US and Russian arsenals even further

India and Pakistan have proved that they have the ability to detonate a weapon, but they are neophytes when it comes to nuclear surety. If the United States and the Soviet Union engaged in risky behaviour, even though they had virtually unlimited funds and technical expertise to throw at the nuclear surety problem, how can we be confident that the cash strapped Indians and Pakistanis will be more conscientious?

We can't be, and that is what people should really worry about

Peter Feaver, who has studied and written extensively on nuclear command and control, is an assistant professor of political science at Duke University in Durham N.

At the Makeshift Aid Station

You girls-
weeping even though there is no place for tears to come from :
crying out even though you have no lips to shape the words;
reaching out even though there is no skin on your fingers
to grasp with—
you girls

Oozing blood and greasy sweat and lymph, Your limbs twitch.
puffed to slits, your eyes glitter whitely;
only the elastic bands of your panties hold in your swollen bellies
though your private are exposed you are
wholly beyond shame:
to think
that a little while ago
you all were pretty schoolgirls

Emerging from the flames that flickered gloomily
in burned-out Hiroshima
no longer yourselves.
you rushed out, crawled out one after the other,
struggled along to this grassy spot,
in agony laid your heads, bald but for a few wisps of hair,
on the ground.

why must you suffer like this?
why must you suffer like this?
For what reason?
For what reason?
you girls
don't know
how desperate your condition,
how far transformed from human

You are simple thinking,
thinking
of those who until this morning
were your fathers, mothers, brothers, sisters
(would any of them know you now?)
and the homes in which you slept, woke etc.
(in that instant the hedgeroses were torn off; who knows
what became of their ashes?)
thinking, thinking —
as you lie among friends who one after the other
stop moving —
thinking
of when you were girls
human beings

TOGE SANKICHI
Translated from Japanese by Richard H. Minear
Atomic Ghost; Poets Respond to the Nuclear Age

WHEN YOU GROW UP,
YOU MUST NEVER LET
THIS HAPPEN AGAIN !!

An Estim ate of Indian Nuclear Weapons'Capability

Since its first nuclear test at Pokaran in 1974, India has made about 25 plutonium metal cores for nuclear bombs, according to data obtained by Nucleonics Week from sources inside India's nuclear weapons development programme.

This figure corresponds with some of the lower range estimates cited publicly in recent weeks. But it is much lower than figures of 60-80 or even higher that have also been published erroneously.

Bomb cores, the actual explosive devices, should not to be equated automatically with militarily usable weapons (e.g.. bombs for aircraft or warheads for missiles). It is not known how many of the cores have been incorporated into actual weapons, if any.

Other data obtained from Indian weapons programme sources indicate the following:

- - India's Department of Atomic Energy (DAE) began producing the bomb cores soon after the 1974 test, as ordered by the Prime Minister's Office. During the last two decades, there has been only one pause in otherwise steady production of the cores. The timing and duration of that pause is not known.

- - Most of the plutonium for the bomb cores was produced by the Cirus and Dhruva research reactors at the Bhabha Atomic Research Institute (BARG) Production has taken place at BARC's secret radiometallurgy laboratory

- - The cores are spherically shaped for use in implosion nuclear bombs. Most or all of the cores arc identical or very similar to that exploded by India in 1974 at the Pokaran test site. The cores were manufactured at BARC for a "reference design" which is very close or identical to that tested in 1974.

This plutonium weapon design, which at most minor modifications, was apparently re-tested at Pokaran last month, is an effort to get more information about it which could be used as a data base in case India follows through on its announced intention to agree to a test ban.

The "reference design" would be a "medium-sized" nuclear bomb, smaller than a bomb India tested last month which used at least a small amount of thermonuclear material. As has been widely reported. India also tested several much smaller devices last month

The Department of Atomic Energy (DAE), which makes India's plutonium, and the Defense Research and Development Organization (DRDO). are now analyzing the results of India's May test series Depending on the results, India may recast the plutonium bomb cores it has already made for the "reference design" bomb and use the metal for production of the newer, freshly -tested devices,

- - All the bomb cores are in the hands of the DAE None of them, and no plutonium. have been turned over to the Indian Ministry of Defence. Western officials confirm that this statement is consistent with their assumptions that India, as yet. has no official military deployment strategy for use of nuclear weapons. Indian sources have stated that Defence Minister George Fernandes himself only found out about the nuclear tests two days before they were conducted,

Critical questions regarding India's nuclear capabilities remain unanswered Among them:

1) How much plutonium does India have for its bomb programme?

The Indian sources would not say how much plutonium was required for a device of the "reference" type. Western analysts estimate that the amount required is likely between five and ten kilograms, depending on design efficiency and production losses. This suggests that the cores India has made account for between 125 and 250 kilograms of plutonium This would account for somewhere between close to half and three-quarters of DAE's total inventory of weapon-grade plutonium. which amounts to very roughly 300 kilo grams

2) How much plutonium is being added to India's current stockpile?

The primary source for India's weapons material stockpile is the 100-MW (thermal) Dhruva reactor, a modern, well-maintained facility that stands outside of International Atomic Energs Agency (IAEA) safeguards and monitoring Assuming the facility is operating between 60% and 70° o of the time — as it was during a 1993 four by the author, and little has changed since Dhruva would be producing about 20 kilograms to *25* kilograms of weapons-grade plutonium per year. That would be enough for between three and five more bombs of the "reference" type each year

India's other mam source for the weapons programme, the Cirus unit it imported from Canada in 1955. is capable of producing up to 10 kilograms weapons-grade plutonium more to this stockpile per year However, the Cirus reactor has been shut down now, and for the foreseeable future due to ongoing problems, and must be rebuilt first It may be at least 18 months before it could resume operation for plutonium production

By Mark Hibbs
Nucleonics Week June 17. 1998
From Nuclear Watch
Center for War. Peace, and the News Media

Nuclear Watch is written exclusively for the Global Beat, an online resource service for journalists sponsored by the Center for War, Peace, and the News Media at New York University

Nuclear Deterrence: A Dangerous Illusion.

By Commander Robert Green, Royal Navy (Retd)

I served in the Royal Navy for twenty years from 1962-82. As a Fleet Air Arm Observer (navigator and weapon system operator), I flew Buccaneer carrier-borne nuclear strike jets from 1968 to 72; and for the next five years in anti-submarine warfare (ASW) helicopters equipped with the WE-177 Nuclear Depth Bomb (NI.)B). As one of four nuclear crew in a Buccaneer squadron, my pilot and I were assigned a target from NATO's Single Integrated Operational Plan, and were ordered to plan to attack it with a free-fall WE-177 thermo-nuclear bomb.

Nuclear Versus Conventional Deterrence Between States

NDB were withdrawn from the Royal Navy in 1992. By then, new conventional ASW weapons had been developed which were able to neutralise all currently envisaged naval targets. Indeed, as far as the USA is concerned

> *"There is nothing it could do with nuclear weapons that it cannot do with modern conventional weapons.*"

Modern industrial states, increasingly interdependent on multinational conglomerates, the globalisation of trade and sensitive to public opinion, are increasingly constrained from going to war with each other. But even if the argument is not accepted, there is a fundamental logical objection to relying on nuclear deterrence. Although the risk of conventional deterrence failing is greater, the damage would be confined to the belligerent States - and the environmental damage would usually be reparable. What is at stake from deterrence failing between nuclear weapon States is the devastation and poisoning of not just the belligerent powers, but potentially of all forms of life on the planet. Meanwhile, retention of nuclear arsenals encourages proliferation of the problem, and with it this unacceptable risk.

Falklands War

In my last appointment as Staff Officer (Intelligence) to Commander-in-Chief of the Fleet, I helped to provide round-the-clock intelligence support to British forces in the Falklands War. I know what a close-run thing that war was. If Argentine aircraft had sunk one of the main troopship before the landing force had got ashore, the British might have had to withdraw. What would Thatcher have done^{0} Polaris had clearly not deterred Galtieri from invading. With victory in his grasp, it is doubtful that he would have believed Thatcher even if she would have seriously threatened a nuclear strike on Argentina. Yet rumours abounded that a Polaris submarine has been moved south within range of Buenos Airs. If she had so threatened, my assessment was that he would have very publicly called her bluff and relished watching Reagan try to rein her in. And in the last resort, it is likely that the Polaris Commanding Officer would have either refused the order or faked a malfunction, and returned to face the court martial.

Gulf War

My scepticism over nuclear deterrence grew when the Berlin Wall came down; but it took the Gulf War to make me break out of my pro-nuclear brainwashing. As the first ex-RN Commander with nuclear weapon experience to speak out against them, it was very traumatic.

In the run-up to the Gulf War, my military intelligence training warned me that the US-led coalition's blitzkrieg/punitive expedition strategy would give Saddam Hussein the pretext he needed to attack Israel • an undeclared nuclear weapon State. If thereby Israel was drawn into the conflict, this might split the coalition. If not, he still stood to gain widespread Arab support for being the first Arab leader for years to take on the Israelis.

My great fear was that the Iraqi leader would be provoked enough to attack Israel with chemical-headed Scud missiles. Knowing that West German technical support was involved in the warhead design, Israel's Prime Minister Shamir would come under massive pressure to retaliate with a nuclear strike on Baghdad. Iraq had the best anti-nuclear bunkers Western technology could provide; but even if Saddam did not survive, what would happen next? With Baghdad a radioactive ruin, the entire Arab world would erupt in fury against Israel and her friends: there would be terror bombing in every allied capital; Israel's security would be destroyed forever; and Russia would be sucked in.

The first Scud attack hit Tel Aviv on the night of January 18. 1991. For the first time, the second most important city of a *de-facto* nuclear State had been attacked and its capital threatened. Worse, the aggressor did not promise Shamir anything in return for not retaliating - fortunately, the warhead was conventional high explosive, and causalities were light. The Israeli people, cowering in gas-masks in their basements, learned that night that their nuclear "deterrent" had failed in its primary purpose. Some 38 more Scud attacks followed.

Meanwhile, in Britain the IRA just missed wiping out the entire Gulf War Cabinet with a mortar bomb attack from a van near Whitehall. They were not deterred by Polaris - yet a more direct threat to the government could barely be imagined.

Nuclear Deterrence Won't Work Against Terrorists

To my surprise, in 1993 the British Secretary of State for Defence agreed with me. In a keynote speech on 16 November at the Centre for Defence Studies in King's College. London entitled "UK Defence

Strategy: A Continuing Role for Nuclear Weapons?". Malcolm Rifkind almost agonised over the problem:

' I have to say that it is difficult to he confident that an intended deterrent would work in the way intended, in the absence of an established deterrent relationship... Would the threat be understood in the deterrent way in which it was intended; and might it have some unpredictable and perhaps counter-productive consequence ? Categorical answers to these questions might be hard to come by. and in their absence that utility of the deterrent threat as a basis for policy and action would necessarily be in doubt it is difficult to see deterrence operating securely against proliferators "

By an "established deterrent relationship" presumably he meant the unstable, irrational balance of terror beiween two trigger - happy, paranoid power blocs - otherwise known as the Cold War. Its inherent instability was evidenced by the inevitable struggle for "escalation dominance." More than 50.000 nuclear warheads was the ridiculous result; while health, education, and other services that make up civilised society deteriorated on both sides through lack of resources

With the break-up of the Soviet Union and an unchecked arms trade, it is only a matter of time before terrorisis get a nuclear weapon. They are the most likely "proliferators", because nuclear blackmail is the ultimate expression of megalomania and terrorism. Yet nuclear deterrence cannot be relied upon against such threats.

The most important underlying point to make here is that the surest way to minimise the chance of a nuclear hijack is to stop treating the Bomb as a top asset in the security business and the ultimate political virility symbol. This nightmare will intensity as long as the five permanent members of the UN Security Council insist on the Bomb to "guarantee" their ultimate security -when in fact it does the exact opposite - while trying to deny it to other States Such a policy of nuclear apartheid is hypocritical and un-sustamable.

Nuclear Deterrence Undermines Democracy

Democracy depends on responsible use of political and military power, with leaders held accountable to the will of the majority of the people. If a democratic nation is forced to use State-sanctioned violence to defend itself, its leaders must stay within recognised moral and legal limits

Democracy within a nuclear weapon state is inevitably eroded by the need for security and tight control of equipment, technology and personnel. When I became a nuclear crew in Buccaneers. I was given a special security clearance before being told never to discuss the nuclear role, even with other aircrew in my squadron, let alone my family It was considered such an honour - only the four best crews were chosen - that no-one questioned it

As Senior Observer of Sea King ASW helicopter squadron in the carrier HMS EAGLE in 1973-74. I had to train the other Observers how to use a thermo-nuclear depth bomb (NDB). The speed and depth advantage of the latest Soviet nuclear submarines over NATO air-launched ASW torpedoes was such that it had been concluded that only an NDB could be guaranteed to destroy them. Now this was just to protect our carrier, not last-ditch defence of the motherland Moreover the Observer would have had to press the button to release it - not the Prime Minister, as they are so fond of claiming There was "Lowv High Yield" switch low yield was about 5 kilotons. and high yield over 10 kilotons - Hiroshima was not much more than that Worse, this would definitely be a suicide mission. because our helicopter was too slow to escape before detonation. For good measure, such an attack would vaporise a huge chunk of ocean, cause heavy radioactive fallout (both from the NDB and the nuclear submarine reactor and any nuclear - tipped torpedoes it carried), and also cause the underwater sonic equivalent to Electro-Magnetic Pulse - quite apart from escalating World War 8 to nuclear holocaust

Yet all these concerns were brushed aside when. I raised them. I was simply told not to worn . and get on with it. So I did but I began torealise that nuclear weapons were militarily useless; and that my leaders - both military and political - were placing me in a position where I could fall foul of the Nuremberg Charter However, the old British military tradition of the Charge of the Light Brigade in the Crimean War, as immortalised by Tennyson, was alive and well

Notice

We have numbered this issue of Anumukti as Volume 11 Number 5 and 6. Whereas by right this would have been Volume 10 Number 5 and 6 That Is how far back we have fallen
What we intend to do is to keep
bringing Anumukti on time from now on and keep publishing all the missing numbers one by one as time permits so that within a year or so we will

"Theirs not to reason why, theirs but to do and die."

Nuclear Deterrence Undermines Security:

The Falklands and Gulf Wars taught me that competing unilateral security leads to more insecurity, both for others and ultimately oneself We need a new understanding of security one that sees it as a safety net forall, not a "win or lose" military game which leaves the underlying problems which caused the war unresolved, and feeds the arms trade. True security lies in fostering a just, sustainable world order

Sanctions or Sanctioned?

In the euphoria that followed the May 11 nuclear tests, one of the causes for self congratulation by Indian nuclear establishment was the fact that US intelligence had failed to detect test preparations. Much newsprint was spent describing details of the various steps Indian 'scientists' had undertaken to hoodwink the all pervasive network of spy satellites and ground based agents. But the ways in which the world-wide US empire is run are not always straightforward and open. Suppose for a moment that the Indian government did have prior permission of US administration to go ahead and have their detonations. This would account for the total failure of US intelligence (comprising multiple and redundant spying agencies: CIA, DIA, NSA, NRO, State's Poli-Mil, etc.) to provide advance public warning. It is indeed difficult to imagine that all of them were sleeping on the job especially after BJP had declared time and again that they would proceed to exercise the nuclear option.

> Rather than apply sanctions, American policy should move from treating India and Pakistan as the problem to incorporating them into the solution as partners in a non-proliferation regime,"
>
> *Henry Kissinger*

Seen from the cynical point of view which often characterises the US government there are certain advantages to the tests But first we must understand the position from the US point of view as it obtained before May 11, 1998. Both India and Pakistan were known to possess nuclear weapons but their actual weapons capabilities were unknown. Secondly both the governments had through repeated statements and overblown rhetoric painted themselves in a position where it was impossible for either of them to sign international nuclear control agreements like the Comprehensive Test Ban Treaty or the Nuclear Nonproliferation Treaty. As a consequence, it was impossible to sell either country 'peaceful' nuclear technology whose markets in the developed world were saturated and whose very survival was at stake in the absence of fresh orders from the 'developing' world.

The Tests have

1. 'Smoked' out two closet nuclear weapons states into the open where the level of expertise of their weaponisation programme can be properly assessed and then capped as part of the normalisation process.
2. Reduced India's manoeuvrability in international relations and forced it to take a belligerent attitude towards China. This is in line with the US plans to encircle and isolate China which is now emerging as an industrial and military giant in its own right.
3. Treed the US from its legal requirement to put an end to its own testing. There is a strong lobby in the US which feels that continued tests are necessary to ensure the safety and reliability of the US nuclear deterrence.
4. Made India offer more concessions to US business and multinationals as a way of countering sanctions.
5. After a decent interval, as part of a process of' normalisation', hitherto "discriminatory" treaties can be signed from a so-called "position of strength" and the way would then be opened for sale of "peaceful" nuclear technology to the region.

Is it a wonder that with so much to gain US intelligence services suddenly develop blind spots!

Surendra Gadekar

■ LETTERBOX

We must not lose sight of the central facts of our situation The nuclear weapons states have weapons of mass destruction. The country in which I live is the possessor of the most modern and sophisticated arsenal of weapons of mass destruction on the planet and is the only nation ever to have dropped nuclear bombs on cities. It has used weapons of mass destruction when its elites believed that their goals would be served by doing so. Unfortunately, I have little doubt that they would do so again.

In their statements concerning India and Pakistan, the NWS have given no indication that they intend to change their policies concerning retention of weapons of mass destruction. Their mentions of disarmament and of their purported compliance with NPT Article VI obligations have shown little perceptible movement from their statements at the NPT Prepcomm prior to the India and Pakistan tests.

The strategy of the NWS appears to be to exert the maximum amount of pressure on India and Pakistan to freeze their nuclear capabilities at the current level that the NWS can bring to bear without committing to any negotiating forum or course of action which could provide an opportunity to focus attention on the nuclear arsenals and policies of the existing nuclear weapons states In the end, it also appears likely that the NWS — or at least some of them — would prefer an outcome in which the nuclear weapons status of India and Pakistan somehow are "normalized," with the NWS appearing to their own populations to have made satisfactory efforts to contain the new arms race, than to have an outcome which forces the NWS onto any path which might actually lead to the abolition of nuclear weapons. It would not be surprising to discover that quiet negotiations are in progress seeking just such a face-saving solution to the current crisis. Such a result might leave current political elites once more feeling safely in control, but would leave the other five billion or so of us in a far more dangerous world.

There is no magic negotiating strategy or set of steps we can urge the NWS to follow, because the elites who control military policy in the nuclear weapons states do not share our goals. The only path which shows promise is the effort to build a truly international movement which has the social power to hold all nuclear weapons states, declared, undeclared, and aspiring, to account. We must ask for exactly what we want, and build the social movement to get it.

Andrew Lichierman < alichterman@igc.apc.org>

The Environmental Effects of Underground Testing

There have been almost 1,400 underground tests during the period from 1957 to 1989 at various sites around the world. Underground tests have been conducted at nine sites in the United States and over 50 in the Soviet Union. In addition. France has conducted underground tests at two sites in the Pacific and at one in Africa. China has conducted them at its testing range at Lop Nor in Sinkiang Province. India has conducted six in Rajasthan while Pakistan has conducted six in Balochistan..

The total vield of the approximate!) 500 Soviet underground tests is about 31 megatons, and that of about 730 U.S. underground tests is about 37 megatons. The other countries do not add much to the total explosive conlent of underground tests, which is approximatel) 71 megatons.

The systematic and rountine injection of long-lived radionuclides (fission and activation products as well as unfissioned plutonium-239) into the underground environment has produced an increasing inventory of radioactive substances. The possibility persists of serious contamination of another important segment of the earth's biosphere, the underground environment, where water is tapped for human use at ever increasing depths and in ever more remote areas of the world.

Assuming a fission yield of about 0.1 megacurie per megaton for stronnum-90 and 0.16 megacurie per megaton for cesium-137. and unfissioned plutonium-239 amounting to 150 curies per nuclear test, we can calculate the cumulative inventories of these three long-lived materials underground. Assuming that about one-fourth of the cesium and strontium has decayed away so far (since underground tests are of more recent occurrence than atmospheric tests, less of the fission-product radioactivity has decayed away the decay corrected inventories ofthe radionuclides would be approximately as follows:

Strontium-90 5.3 million curies
Cesium-137 84million curies
Plutonium-239 0.2 million curies

In addition to these three, there are substantial quantities of activation products, as well as other long-lived fission products such as technetium-99 Carbon-14, which is formed by absorbtion of neuirons by nitrogen and is a major contaminant in atmospheric testing is not such a big cause for worry in underground testing since the nitrogen content in the underground environment, is generally much lower

Silicon and aluminum, common constituents of soil, and manganese, an important trace element taken up by plants, form radioactive isotopes through neutron capture However, their half-lives are only 2.6 hours 2.3 minutes, and 2.6 hours, respectively Therefore, they arc not important sources of radiation beyond a few hours after an underground test In the following we will look in some detail at effects of testing in the US, Soviet Union and by French in the Pacific since there is some data available on these Other countries have not provided any data on the effects caused by their testing programmes.

US Underground Testing

Underground testing has often resulted in prompt releases of radioactivity to the atmosphere, mainly through accidental venting In the U S underground nuclear weapons testing programme, it has been estimated that between 1957 and 1970, 25. 3 million curies of radioactive fission products were released to the atmosphere from 30 underground tests. The venting of Baneberry alone, in 1970. injected 67 million curies of radioactive fission and actvaiton products into the environment Between 1970 and 1988. it has been estimated that 54.000 curies have been released as a result of 126 underground tests of 126 releases, four were containment failures, four were late-time seeps. 10 were controlled tunnel purgings. and 108 were "operational" (intentional) releases

The following is a list of some significant venting incidents reported by the U S Congressional Office of Technology Assessment (1989) (the quantity of radioactivity is normalized to 12 hours after the test)

Test name and year	Radioactivity in million curies
Plane. 1962	19
Ecl. 1962	19
Des Moines. 1962	11
Baneberry. 1970	6 7
26 other teste	38

Underground nuclear tests leave behind a large volume of crumbled rock and radioactive materials. Assuming a total yield of U S underground tests of 37 megatons and that one-fourth of the strontium-90 and cesium-137 have decayed away, approximately 2 8 million curies of strontium-90,4 4 million curies of cesium-137. and 110,000 curies of plutonium-239 remain in the environment

The long-term dangers arising from wastes in the underground environment have not yet been carefully assessed. According to Eisenvbud (1987) *The quantities of debris involved are huge, but obtective evaluation of potential long-range ricks has not been possible because little of the basic data* *have been made available.*

Soviet Nuclear Testing

The Soviet Union has conducted its 503 underground tests at many locations in its territory. The multiple explosion sites mean that underground contamination potentially affects more territory and larger populations and constitutes a greater threat to future generations in the Soviet Union than in any other country.

The Tsyb Commission considered only the seismic impact of underground explosions. It did not discuss venting of radioactive materials from underground tests.

Tokhtarov presented some data regarding emissions from undertround nuclear explosions. The first and perhaps largest release occurred in January 1965, from a nuclear explosion to excavate a water reservoir at the confluence of the Chagan and Ashisu rivers. His estimate of radiation levels "at traditional pastures and watering places" was 50 millirocntgens per hour, though the time after the explosion at which this level prevailed is not specified. The thyroid dose to children was estimated at 53 rems and the bone dose at 15 rems.

Tokhtarov noted that prior to 1980 underground nuclear tests in the Soviet Union were conducted at shallow depths, and he implied that venting was the rule rather than the exception. According to the report, the military admits that about 30 percent of underground explosions at the test site (or about 100 tests) were followed by the release of radioactive gases. Also cited were three cases of venting in the late 1980s, despite the fact that these tests were conducted at depths of 500 to 600 meters: on May 7,1987, the radiation level in Semipalatinsk reached 350 to 500 micro-roentgens per hour; on September 18, 1987, the radiation level was 45 microrocntgens per hour; and on February 13, 1989, the radiation level at the village of Chagan was 3,200 micro-roentgens per hour. (Typical natural background radiation is on the order of 10 microrocntgens per hour).

There were over 200 atmospheric tests and over 500 underground tests on Soviet territory. The available evidence points to the conclusion that protection of public health and the environment was scant, even compared to other nuclear weapons states. Environmental measurements of radiation, dosimetry, and tracking of exposed populations made public so far are inadequate to provide a good picture of population exposures. Medical data are insufficient to describe accurately cancer incidence or other measures of radiation effect.

Estimated inventories of selected radionuclides due to underground Soviet tests (Decay-Corrected)

Radionuclide	Inventory
Strontium-90	2.3 million curies
Cesium-137	3.7 million curies
Plutonium-239	75,000 curies

French Testing at Moruroa

French underground testing in the Pacific poses a different set of problems to other underground test sites since the sea is an integral part of the test site. At the time of the explosion, fracturing of the atoll surface can trigger landslides, tsunamis (tidal waves), and earthquakes. Possible long-term effects include leakage of fission products to the biosphere and transfer of dissolved plutonium-239 from the lagoon to the ocean and the food chain.

Physical Damage to the Reef

The upper layer of the atoll is made up of reef carbonates, mainly limestone. This limestone cover is approximately 300 meters thick in the south of the atoll, increasing to 430 to 550 meters in the north.

Each scientific mission to Moruroa has described severe damage to the integrity of the atoll. The damage includes fissures in the limestone and surface subsidences of large areas of the atoll. Fissures are propagated by the testing, a result of the cumulative compacting of the limestone. Fissuring serves to increase lateral and vertical water transport in the carbonate body of the atoll, possibly resulting in more rapid leakage of fission products. The French authorities claim that no new damage is occurring because the tests are no longer conducted under the reef crown but under the lagoon. This claim is contradicted by underwater observations of the Cousteau mission.

Triggering of Tsunamis, and Earthquakes

At least one major test-related landslide and consequent tsunami happened in Moruroa, on July 25, 1979. Apparently, the 120-kiloton weapon, which was supposed to be lowered into an 800-meter shaft, got stuck at a depth of 400 meters and could not be dislodged. The French authorities decided to explode the device anyway. This explosion resulted in a major underwater landslide of at least one million cubic meters of coral and rock and created a cavity, probably 140 meters in diameter. The underwater landslide produced a tidal wave comparable to a tsunami, which spread through the Tuamotu Archipelago and injured people on the southern part of Moruroa Atoll. French authorities initially denied that any mishap had occurred and declared that the tidal wave was of natural origin, but in a publication in 1985 they acknowledged "the accident of 25 July 1979."

Venting of Fission Products

Scientists of Australea, New Zealand, and Papua New Guinea in 1983 were authorized to carry out a single experiment in situ at Moruroa. Their measurements demonstrated tritium levels were 500 becquerels per liter while the expected concentration due to atmospheric fallout should have been in the range of 0.2 becquerels per liter. These high levels are probably due to venting. The Cousteau mission in 1987, measured radioactivity of plankton, which is an even better indicator of venting. In plankton, they found an iodine-131 concentration of 22.000 picocuries per kilogram.

Thus, two separate scientific missions, on which major restrictions were imposed, were still able.

independently of each other to find typical indicators of short-term venting.

Long-Term Leakage to the Biosphere

According to a model formulated by Hochstein and O'Sullivan (1985), an underground nuclear explosion in rock saturated with seawater can set up an artificial geothermal system. The heat stored in the explosion chamber is of the order of 10^{12} calories per kiloton of yield. In addition, heat generation due to radioactive decay goes on after the explosion of fission bombs, at a rate of about 595 calories per second per kiloton of yield. After an explosion, seawater enters the chamber and is heated up by about 25 to 50° Celsius by both stored and newly generated heat. The heated seawater dissolves the glassy materials, liberating the nuclear waste which transfers slowly upwards through the extended chimney. While the concentration of the radionuclides decreases by diffusion and absorption, the heated cell transferring the radionuclides moves upwards with a speed of about 10 meters per year, according to the computer simulations. Under the assumptions of this model, radionuclides from a depth of around 500 meters would reach the cracks of the lagoon in less than 50 years instead of the 500 to 1,000 years assumed by the French authorities.

The first hint that the model of Hochstein and O'Sullivan might be correct was the discovery of cesium-134 by the Cousteau Mission in 1987. In December 1990, Greenpeace too found cesium-134 in plankton collected outside the 12-mile exclusion zone around Moruroa. Recent studies indicate that leakage is occurring even faster than initially predicted.

The 120 underground tests conducted at Moruroa have in effect turned it into a long-term waste dump The total amount of plutonium-239 from these tests and the three at Fangataufa is about 18,450 curies Based on a rough estimate of 2.5 megatons total yield of underground tests, the amount of cesium-137 and strontium-90 dispersed would have been 400,000 curies and 250,000 curies respectively. About three-fourths of the cesium and strontium still remain underground and some may have found its way into the lagoons and ocean. As a repository for nuclear wastes from underground testing, Moruroa is less than ideal The geological structure is water-saturated, and there are natural fractures as well as a network of fissures due to the explosions. Moreover, the absorption capacity for the basalt of Moruroa as estimated by the French authorities is very low

"Safety Trial Causes Pollution"

The land area of Moruroa has been used to store radioactive waste (including scrap metal, wood, plastic bags, and clothing) in a huge heap on the north coast of the atoll, which covers 30,000 square meters. In addition, on July 21, 1966. a bomb broke apart on the surface of Moruroa, dispersing plutonium-239. This plutonium-239 was confined to the area by fixing il in place with a layer of bitumen. Moruroa was also used as a safety trial area (A "safety trial" is a test to check whether an atomic bomb will explode on impact with a hard surface—as in the event of a plane crash. In the case of a "safe" bomb, or a "successful" safety trial, the impact does not cause a nuclear detonation but breaks apart the bomb, scattering plutonium-239 about the site.) Cyclones hit Moruroa mainly in 1981, washing radioactive waste from the coral rim into the lagoon, including the plutonium -impregnated bitumen.

Due to these waste management practices, the sediment of the lagoon contains an estimated 20 kilograms of plutonium-239 At the time the Australian, New Zealand and Papua New Guinea Mission visited Moruroa, plutonium-239 concentrations in the air were about four times greater than in continental France The mission estimated that about 20 gigabecqucrels of plutonium-239 from the sediment of the lagoon arc transported annually to ocean waters. This is consistent with findings of the Cousteau Mission that concentrations of plutonium-239 in the lagoon entrance are about ten times greater than in the lagoon itself They also stated that the observed concentrations in the sediment and in the water are much too high to be attributed to global atmospheric fallout and are therefore of local origin and due to redobilization from sedimentary deposits. There is evidence that plutonium-239 is accumulating in the food chain

Katherme Yih

Source Radioactive Heaven and Earth

Environmental Effects of Nuclear Weapons Production

Howard Hu, Arjun Makhijani

Roughly 70,000 nuclear war heads have been fabricated worldwide. This does not include reworking of materials and components of obsolete weapons into new ones. There are many aspects of environmental contamination resulting from nuclear weapons production that we cannot estimate due to lack of data. But we can make some order of magnitude estimates of waste generation and environmental contamination from some of the principal processes.

- One hundred to two hundred million metric tons of uranium-mill tailings containing 100,000 curies (about 4,000 terabecquerels)each of radium-226 and thorium-230 from the estimated 400,000 metric tons of natural uranium used for military purposes;
- Over 400,000 metric tons of depleted uranium;
- About 3 billion curies (100 million terabecquerels) of high-level radioactive waste from plutonium production (including only strontium-90, caesium-137 and their daughter radionuclides yttrium-90 and barium-137). (This estimate is not corrected for radioactive decay; such a correction would reduce it by about one-half);
- Twenty million curies (about 700,000 terabecquerels) of krypton-85 (non-decay-corrected) into the atmosphere due to reprocessing;
- Thousands of square kilometres of highly contaminated land from production processes and accidents;
- Global contamination from fallout due to atmospheric nuclear weapons tests amounting to 30 million curies (one million terabecquerels) combined of strontium-90 and caesium-137 (decay-corrected), and 10 million curies (0.4 million terabecquerels) of carbon-14 due to atmospheric testing. Additional inventories of fission products and unfissioned plutonium have been left underground due to underground testing.

Damage Far Worse

These summary estimates provide a starting point for the work ahead in making estimates of the contamination in specific areas and countries. They are to be regarded as indicative rather than definitive. Moreover, they do not convey the real extent of the damage. Some of the worst damage has been in the former Soviet Union. Entire river systems have been contaminated in some cases, as for instance with the river system near the Chelyabinsk-65 plant. Lake Karachay at Chelyabinsk-65 is perhaps the most contaminated body of water on Earth. The dose rate near the pipe that discharges radioactive wastes into it is 6 grays per hour, which would yield a lethal (LDS0) dose in about 45 minutes.

Highly radioactive liquid wastes that result from reprocessing have been responsible for the worst accident resulting from nuclear weapons production. This was the explosion of a tank at Chelyabinsk-65 in September 1957. It resulted in the contamination of about 15,000 square kilometres of land and the evacuation of over 10,000 people. Dozens of tanks in the United States and elsewhere are at risk of explosions.

The Price Has Been Paid By Others

Uranium mining has been responsible for contamination not only in the nuclear weapons states but also in many other countries. Some of the most polluted areas form nuclear weapons production are in East Germany, which supplied the Soviet nuclear weapons programme, and in the Third World, which supplied the programmes of the United States, United Kingdom, and France. Even within the nuclear weapons states, uranium mining and resultant contamination have disproportionately affected tribal peoples.

The nuclear-weapons industry has contaminated groundwater, surface waters, seas, and oceans. For instance, the sea off Sellafield in England and the seas off Russia have been the dumping grounds for large amounts of radioactivity. In the United States and elsewhere, groundwater at many of the sites where weapons factories are located has become highly contaminated. While this water is not now being used for domestic consumption, it is not evident how its use can be regulated once institutional control of the sites is lost, or once they have been designated for other uses.

Decommissioning and cleaning up nuclear-weapons plants will produce additional large quantities of waste, the magnitude of which will become clear only over the next decade or so as decommissioning proceeds in the United States and possibly in other countries. Dismantlement of unwanted nuclear weapons and disposition of the fissile materials they contain present further formidable security and environmental challenges.

Exposed Populations

Broadly speaking, the making of nuclear weapons has exposed five groups of people to environmental and health dangers:

- 1. Workers at nuclear weapons facilities.
- 2. Armed forces personnel who participated in atmospheric weapons testing.
- 3. People living near nuclear weapons sites.
- 4. People who were subjects of experiments.

- 5. The world's inhabitants for centuries to come.

These categories include only those affected by the production and testing of nuclear weapons. The transportation, deployment, and possible use of nuclear weapons are not within the scope of this paper Generally, the most intensely exposed people have been workers in nuclear-weapons plants and testing facilities and members of the armed forces. Within these two populations, the extent of exposure varies according to the specific nature of their duties and length of service.

The third set of victims, often called "downwinders," are people who live near nuclear-weapons facilities. The definition of "near" extends in some cases to hundreds of kilometres downwind, especially in the case of atmospheric nuclear-weapons testing and large intentional or accidental releases, such as those that occurred at Chelyabinsk-65 or at Hanford in the United States. Some downwinders have been as highly exposed as workers and armed-forces personnel. This is certainly the case for some affected by the explosion at Chelyabinsk-65, for iodine-132 exposures from the first two decades of operation of the Hanford plant, and for nuclear testing downwinders among the people living near the Soviet test site near Semipalatinsk in Kazakhstan. Recent revelations in the United States have brought to light human experiments involving thousands of people. Finally, there have been and will continue to be exposures to the entire global population, mainly due to atmospheric nuclear-weapons testing but also to releases of krypton-85 and other gaseous radionuclides from plutonium production. Given the long lived nature of some of the radionuclides involved, these exposures will persist for thousands of years.

It is possible to make rough, order-of-magnitude estimates of the number of exposed armed forces and worker populations in some instances. The figure for exposed "downwinders" is considerably more fluid, mainly because of the interlinked problem of defining the boundary of the "downwind[1] area and uncertainties about doses offsite.

About 2,500.000 members of the US armed forces participated in the atmospheric nuclear-weapons-testing programme. The number or workers in the US nuclear weapons complex at any time has been to the order of 100,000 since the mid-to-late 1950s, excluding workers in uranium mining and milling. (Current employment during the decommissioning phase is actually higher.) Considering some turnover of workers and recent increases in employment for clean-up operations, several hundred thousand people have at one time or another worked in the US nuclear-weapons complex.

In the Soviet Union, the number of workers involved in the nuclear weapons complex has been reported to be to the order of 1 million, including people engaged in uranium mining and milling. No reliable estimate is available for armed forces personnel involved.

Large numbers of people were involved in uranium mining and milling in other countries Perhaps the largest number in a single place was the 450,000 uranium mine and mill workers in East Germany which supplied much of the uranium for the Soviet nuclear arsenal. Tens of thousands of people, at the very least, have been involved in uranium mining in China, including the period of particularly labour-intensive mining during the Great Deap Forward in the late 1950s and early 1960s

While we have not attempted to gather comprehensive data on the number of workers involved in this global industry, it would appear that at least two million people have been involved in various aspects of nuclear-weapons production and worldwide: the true figure is probably considerably higher

The levels of exposure to radiation of the four population groups vary widely Exposures due to global fallout are to the order of a few tens of microsicverts per year. However, the dispersed nature of fallout has resulted in exposure of billions of people to such levels of radiation.

Researchers have made various estimates of levels of exposures to downwinders. The most highly exposed groups that we know about are those living downwind and downriver of the Chelyabinsk-65 and downwind of Hanford in the early years of production The downwind exposures near Oak Ridge, Tennessee may also be high, but this remains the subject of study and controversy

The most highly exposed groups have tended to be workers. The most severe exposures of workers lor whom some data is available were in the Chelyabinsk-65 gas graphite reactor and reprocessing plant Worker doses in the early years averaged about I sievert. according to data published so far

However, under many circumstances, notably in facilities that processed uranium, internal exposures may have been high among certain groups of workers For instance, at the uranium-processing plant near Fernald, Ohio, data on employees indicate cumulative lung doses of several sieverts for some production workers. Yet neither the plant's corporate contractors nor the Department of Energy calculated internal doses from urine and lung-counting data that were collected at the plant.

Even greater uncertainties exist in regard to internal exposures for armed forces personnel, notably to alpha-emitting radionuclides. Thus, the overall exposures to workers, armed forces personnel, and downwind populations will remain the subject of considerable uncertainty and controversy, for some time Because most official data on these subjects in most countries are still secret, it is impossible to know whether reliable quantitative estimates can be produced at least for an appreciable fraction of the exposed population.

The Poor State of Data

Estimating the total toll on human health of nuclear-weapons production worldwide is almost impossible given the types of uncertainties discussed. Aside from the global fallout effects of nuclear weapons testing, estimated to produce hundreds of thousands of excess cancer fatalities over the centuries, uranium mining has been responsible for the largest collective exposures to workers. While precise global estimates are at present impossible, we note that one estimate puts the number of workers who have died of lung cancer and silicosis due to mining and milling in Last Germany alone at twenty thousand people.

Unfortunately, we cannot make similar estimates on a global level of the disease burden that may have resulted from occupational exposures in uranium mining, milling, and the industries related to plutonium reprocessing and nuclear-weapons manufacturing. It is instructive to note that many of the occupational mortality studies of uranium miners in the United States and Canada have estimated lung-cancer risks 2 to 6 times higher that expected. To the extent that this reflects generic risks shared by all uranium miners, and that working conditions have been similar or worse in other uranium-mining countries, this would mean that the mining of uranium for nuclear weapons has led to thousands of excess lung cancers. It is also apparent that a disproportionate share of that burden fell on indigenous or colonised peoples who lived in the areas of and were employed as workers.

In general, it is difficult to determine the validity of various studies in the face of serious problems with the quality and completeness of the data. For instance, in 1994, US officials admitted that even external dose data for workers have some serious deficiencies. In fact, portions of the data were entered into the radiation dosimetry records of workers when the badges were not turned in.

Russian data on health are clearly suspect, even for groups of workers and off-site populations living near Chelyabinsk-65 with high exposures. Health outcome data show far fewer than expected leukacmia or other cancer fatalities. This result is at considerable variance with well-established risk factors from medical radiation exposure studies and follow-up of Hiroshima-Nagasaki survivors. It is reported that doctors were forbidden to make radiation -related diagnoses, on pain of punishment. Thus, while some dose data indicate that one should find relatively high levels of fatal cancers, the health findings do not correspond to the dose estimates. New diagnoses such as "weakened vegetative syndrome" and even "ABC diseased unknown elsewhere, were created in Russia, possibly to fill the void for radiation-related diagnoses banned by nuclear authorities.

It is also impossible at present to estimate the disease burden due to community exposures to non radioactive chemical pollution emitted by industries associated with nuclear weapons. The data based is so inadequate that it does not permit even qualitative discussion of the health impact for individual countries, to say nothing of worldwide estimate. There are anecdotal reports of damage that are inconsistent with radiation damage. Such damages may be linked to chemical discharges. However, such emissions have not been monitored carefully, or indeed at all for most of the period for nuclear weapons production, so far as publicly available data indicate.

The Legal Question

World Court Judgement

On 8 July 1996 in The Hague, the International Court of Justice gave its Advisory Opinion on the question

"Is the threat or use of nuclear weapons under any circumstance permitted under international law?"

The Court highlighted:
"unique characteristics of nuclear weapons, and in particular their destructive capacity, their capacity to cause untold human suffering, and their ability to cause damage ta generations to come "

Thereby, the Court confirmed that nuclear weapons are in the same stigmatised category of weapons of mass destruction as chemical and biological weapons Indeed, the effects of nuclear weapons are more severe, widespread and long-lasting than those of chemical weapons of which the development, production, stockpiling and use are prohibited by specific convention regardless of size Also radiation effects are analogous to those of biological weapons, which are also outlawed by specific convention.

The Court could find no legal circumstance for the threat or use of nuclear weapons. Also it endorsed the view that threat and use are indivisible. The Court confirmed that, as part of humanitarian law, the Nuremberg Charter of 8 August 1945 - paradoxically signed two days after the nuclear strike on Hiroshima and the day before the one on Nagasaki -applies to nuclear weapons.

Continued from page 2

Right wing madness

The present madness is the.creation of the current right wing, nationalistic sentiments of the Vajpayee government and its tenuous position in the Indian parliament. My assessment, and suggestion, is that if the US and the other big bullies let this sink in a bit, while Pakistan explodes her own bomb (if I were in the white House, I would not do much to dissuade Pakistan from doing it), the tide would turn against Vajpayee on its own momentum as the arms race in the subcontinent builds up and the dissenting voices in India could be heard beyond the initial euphoria of the ignorant and chauvinists. India herself has to respond negatively to this madness, as I am sure ultimately it will. Economic sanctions help to delay that response.

Aqueil Ahmad

Old wine in new bottle

The tests, have been claimed to be a major scientific and technological achievement. We. scientists in various disciplines, while expressing our deep dismay and unhappiness at this action of the Indian Government, wish to point out that the magnitude of the S&T should not be blown out of proportion. The technology involved is for the most part decades old.

The country has been committed to an expensive weapons programme without a national debate.

We wish to recall emphatically, the horror that is nuclear war. There is a long tradition of eminent scientists who have consistently argued against the induction of nuclear weapons. The horrors of nuclear war cannot be forgotten, no matter what. How can we feel happy and secure in a world in which every country feels proud of its nuclear weapons capability and is convinced of the deterrence tactic ?

Signatures of more than 60 scientists from various Indian Institutes and Universities.

It's cheap patriotism

What with Anupam Kher speaking of 'our neighbours' molesting our sisters and daughters and someone from the external affairs ministry talking of it takes two to clap, but one to molest' I really shudder at the language and idiom of intolerance and cheap patriotism that is being unleashed under (his regime.

Dr. Rowena Robinson
IIT Bombay

Shot in the foot

Your letter started me thinking. 1 suppose the main impact on Indian science will be to encourage or prolong the life of the wrong kind of 'science', especially in physics. I am so disheartened about this already that I am not sure this additional shot in the foot will hurt much more.

I am saddened (hat we have gone so far in denying our Gandhian heritage, which is the only sure long term guide to the future of humanity as a society. This also seemed to be our main role in the 'comity' of nations.

Dr. T. V. Ramakrishnan
I.l.Sc. Bangalore

They have blown up our hopes and aspirations for peace in our generation The sadness is indescribable

Dr Zia Mian
Princeton University

Uncle Sam 's hipocrisy

Today we hear everyone in Washington asking for sanctions against India because of these tests Yet. it is well known that Israel has tested a nuclear device and currently has an inventory of at least 200 nuclear weapons and an IRBM delivery capability But no one will even mention that matter in the American news media Remember what happened during (he Carter administration Israel and the apartheid Afrikaner regime in South Africa tested a nuclear device near the Indian Ocean The Carter administration immediately orchestrated a flimsy cover-up. publicly claiming that it was a meteorite hitting the satellite, in order to avoid the triggering *o(* sanctions against Israel Of course, the news media in the United Slates dutifully accepted the cover-up and the matter disappeared down the Orwellian memory hole What we see now in Washington are crocodile tears being shed over the Indian tests. The United States has done absolutely nothing to stop Israel's rapidly escalating nuclear weapons programme despite more than enough leverage to do so. Some are more equal than others.

Start satyagraha against Nbomb

It appears that we have burned up a lot of electrons during the past several days. But talk is cheap Politicians value deeds, not words. Right now we need to be pouring tens of thousands of people into the streets of the United States, Britain, France. Russia. Canada. Europe. Japan, Australia, New Zealand. Israel. Pakistan, India and as many other countries of the world as possible, all demanding immediate nuclear disarmament. People Power. Politicians pay attention to that Back in the 1980s there were tens of thousands of people protesting all over the world against the Reagan administration's aggressive nuclear weapons policies We need that all over again, only tenfold. They must march, protest, demonstrate, blockade,etc. What Gandhi called Satyagraha, truth-force. Personally, I think this is the only meaningful response we have to what has just happened and to what could very well happen in the immediate future.

People of the world unite! We have only our nukes to lose!

Francis A. Boyle
Professor of International Law
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Need for total disarmament

While Clinton chides India to sign the Comprehensive Test Ban Treaty. India's nuclear tests demonstrate the pointlessness of the treaty. Despite all of our movement's best efforts for more than a generation, we've been trumped by technology. India seeks laboratory testing capability as well, a goal the US would be comfortable with!

I believe any forward movement towards nuclear disarmament is waylaid by further advocacy and time spent on ratification of the CTBT. It is nuclear abolition or nothing, and as King observed, 'non-violence or non-existence." Arms control is not disarmament.

Can there be any doubt that it serves the interest of the US government and the military-industrial-prison complex to claim ignorance of imminent Indian nuclear explosions? Already conservative senators are exploiting this claim of ignorance to bolster their own perspective that the entire arms control regime is futile. Yes, the regime of arms control, the hope that incrementalism would lead to disarmament faster than technology outpaces the diplomats is indeed a futile hope. Arms control was never enough, and the CTBT now awaiting ratification should be abandoned and left behind by any nuclear abolition movement worthy of the name.

It is altogether fitting, then, that the last few months of tension among the purveyors of weapons of mass destruction have produced the proliferation of nuclear inspection and verification teams comprised of citizens whose allegiance is global, not national, but who are assuming the responsibility for the weapons in their own midst, deployed in their name.

The Citizen Verification Team at Los Alamos in March proclaimed that its goals are to " 1) educate the public about the United States' own weapons of mass destruction; 2) to call for international transparency regarding all programs which design, produce, or stockpile weapons of mass destruction; 3) to inspire a process of societal verification to bolster non-proliferation and disarmament efforts."

These seem far more worthy aims than another minute advocacy for the tool of proliferators, the Comprehensive Test Ban Treaty.

The Pakistani Foreign Minister said "it seems that the Indian leadership has gone berserk." He obviously knows the condition - Pakistan plans to follow suit. But the leader in this Fool's Parade is certainly the United States, under the banner of the CTBT.

Jack Cohen-Joppa
Nuclear Resister

I am sorry. Have the people been advised to take iodised salt, calcium and potassium supplements (to lower the uptake of radioactive iodine, caesium and strontium)? It would also help if they could use distilled water for at least the next three months for all drinking and cooking. It will help to leach out inorganic materials (which the body does not need). If perspiring use fruit juices, and no regular water just distilled water.

All underground nuclear tests leak some radioactivity to the environment. Several so close together in time and place must have leaked! I understand one was a hydrogen bomb - probably using the CAN DU reactor to provide the tritium!

2nd letter: While I do applaud the initiative of the anti-nuclear groups to condemn Canadian involvement with the nuclearization of India. I think we might use this outrageous event to forward a global disarmament strategy. We could back Pugwash is calling for a more active role of so called Middle Sized Countries, with Canada leading. We could seize upon and enlarge this initiative.

This Middle Sized Countries delegation could mediate between the five nuclear powers on the one side, and India/Pakistan on the other. Hopefully they could broker a swap between them providing for no more tests whether under ground or sub-critical, bona fide disarmament by the five nuclear powers, full signing by all parties of the nuclear non-proliferation treaty and right of inspection of all countries by the IAEA.

Rosalie Bertell

N-deterrence is dangerous

The Nuclear Weapons States (NWS) and NATO have stated repeatedly that N-weapons are essential for their security. Accepting those (incorrect) statements, an obvious conclusion is that the weapons are essential to Indian security, neighbour to a nuclear-armed China and with Pakistan claiming (and then denying) that it has nuclear weapons.

Nuclear deterrence is far too dangerous, because a single failure of deterrence between two heavily-armed nuclear states must result in destruction of both states, enormous radioactive contamination of whole continents, and probably the end of human civilization. As stated authoritatively by the Canberra Commission, "The proposition that nuclear weapons can be retained in perpetuity and never used - accidentally or by decision - defies credibility." My paper "20 Mishaps that might have started accidental war" shows how real the actual risk of inadvertent war was during the Cold War. A small risk continuing over a long period adds up to near certainty of disaster.

The nuclear arms race between U S A and USSR was the biggest mistake in human history. First, and by far the most important it risked destruction of human civilization and possible extinction of the human race. The risk is still present. Second, it was enormously expensive, taking resources away from many unmet human needs. Third, it has resulted in radioactive contamination which has rendered large areas of both countries uninhabitable for centuries, and has caused significant radioactive contamination worldwide.

There are good reasons for India and Pakistan not to repeat that mistake. If they do. the likely result is destruction of those two nations and severe damage to their immediate neighbours, by a limited nuclear war at some time in the future As to the expense, these countries are far less able to tolerate it than was the United States

India has not broken any undertaking of theirs nor any international law. They have not signed the NPT nor the CTBT. and have given logical reasons for not doing so. I believe the UN has no legal reason to apply sanctions. If the western NWS and their allies apply sanctions, the non- N WS will consider, perhaps correctly, that the purpose is to maintain the military superiority of the present NWS by punishing and threatening to punish other nations that try to acquire nuclear weapons

A possible consequence of a South Asian nuclear arms race is that a limited nuclear war there would so horrify the people of the world, by the destruction of an ancient civilization and its famous cities, and the terrible human suffering involved, that the NWS would be persuaded to give up their nuclear arsenals. We do not wish for it to happen that way, but we see it as a possibility.

A proper response by the NWS and their allies is to admittheir mistake, and to immediately renounce all dependence on nuclear weapons. They must then disable all the weapons promptly, and dismantle them permanently as soon as possible.

A lan F Phillips <aphi@web net>
Physicians for Global Survival

The Killing Advantage

Please note that the following refers only to direct deaths in the area of the blast, not distant deaths caused by fallout or other secondary causes.

Deaths produced by Pakistan attacks on India with 25-kitoton bombs striking highest population areas:

No of 25 kt bom bs	Deaths in Millions
15-32	19.2
182-379	46.8
1,630-3.395	128

Deaths produced by Indian attacks on Pakistan with 35 kt bombs in highest population areas

No, of 35 Kt warheads	Millions of deaths
76 1-163	13.5
253-542	22.4
811-1,739	46.1

Conclusion India's head is screwed on backwards, if it thinks for a second that It has derived any advantage via nuclear "deterrence " India's population densities are so great that only 15 to 32 Pakistani weapons can cause 19.2 million direct deaths in India. By contrast it would take fully 76.3 to 163 Indian nuclear weapons to cause roughly 13.5 million direct Pakistani deaths

India not only shot itself in the foot by choosing to go nuclear; it has revealed to the world its monumental incompetence in analysis. If does not take a wizard to count

[illegible]es <ike@swva.net>

Gandhi given second burial

On Buddha's birthday, the coalition government led by Bharatiya Janata Party put the finishing touch to more man three decades of erosion of Gandhi's legacy by conducting three nuclear tests With that show of military muscle. Prime Minister Vajpayee declared India to be a nuclear weapons state and staked its claim as a world power In so doing India has. for the time, thrown away a rarer and incomparably finer claim to great power status that it had already established in the minds and hearts of the people of the world India was already a great power for having given life during its independence movement to the philosophy of non-violent militant action The tests were, as some Indian commentators have remarked, the end of moralism as the basis of global politics for India, and the establishment of power politics

India's nuclear weapons programme has little internal strategic coherence India already possesses overwhelming conventional superiority with respect to Pakistan, which it has demonstrated in wartime India's programme allows China a cheap way to keep India oft balance by providing military assistance to Pakistan

India may aspire to match China in the size and variety of its arsenal (thought to be about 400 to 500 warheads), but it will have to expend enormous resources to do so. Most of the cost of nuclear weapons programmes is not for the weapons themselves, but for delivery systems, command and control, security, and related programmes dealing with deployment and potential use of weapons Moreover, since it does not have submarine-based long- or medium-range missiles, which are among the most expensive of systems, India's weapons will be relatively vulnerable to pre-emptive attack and destruction

Moreover, India simply cannot match the industrial and economic infrastructure of China, though they have comparable populations. For instance, India's installed electric power capacity is only about 80,000 mega watts, while China's is about 260,000 mega watts. China runs balance of payments surpluses, while India runs deficits. China has foreign exchange reserves many times those of India. It is relatively invulnerable to sanctions, since many large multinational corporations derive substantial portions of their profits from export-oriented manufacturing in China. To try to approach China's nuclear arsenal in size and sophistication would make India fall farther behind in industrial infrastructure, economic growth and consumer goods, even if the effect of sanctions is ignored.

Trying to create a substantial nuclear arsenal will complicate rather than promote solutions to India's two main border disputes with its neighbours: that with China in two sectors and that with Pakistan in Kashmir. By raising the level of tensions, it provides incentives to both Pakistan and China (which may act largely through Pakistan) to destabilize borders and force India to expend more resources in unproductive avenues.

If there is a silver lining to India's tests, it is to expose the hypocrisy of the nuclear weapons states and to create a sense of urgency among the world's people about the need for complete nuclear disarmament. The legacy of Gandhi can only be reclaimed by popular actions and demands upon recalcitrant powers that have grown too used to wielding weapons of terror and mass destruction.

Arjun Makhijani
Institute for Energy and Environmental Research, Takoma Park

Living in constant fear

Earlier this month, I was in Kazakhstan, home of some 490 nuclear tests conducted by the Soviets over a 40-year period, until 1989. More than 19 million hectares of land were destroyed, and more than 75 percent of the inhabitants in the areas where the tests were conducted suffered radiation exposure. But these facts don't shock me so much as the words of the people I met in Semipalatinsk, one of the former nuclear test areas in the northeastern part of the country. Almost a decade after the end of testing in Kazakhstan, people still are surviving the consequences and living in fear of radiation. Radiation is a difficult topic to avoid — it is part of their daily existence.

In testing these nuclear devices, India and Pakistan can be added to the list of countries that have guaranteed fear for their populations and the people of neighboring countries. India and Pakistan may not be signatories of the Comprehensive Test Ban Treaty, but this testing is a violation of human rights and a violation of our earth. And whose choice was it? The people have no choice when governments decide to test nuclear weapons. And ultimately, our earth has no choice.

The United States and the global community must ensure the right to live free from nuclear testing, without exception. With every test that is conducted, we further disrupt the delicate ecosystem that sustains us. Testing is a road to ultimate self-destruction and one that none of us can afford to take.

Nicole Cheetham

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Rs. 36/ - per year (6 Issues)
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Rs. 360/ for life (only within India)

This Special issue: Rs. 15/-

Demand drafts should be drawn on the state Bank of India, vaiod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/- collection charges

Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Published by S.Gadekar for sampoorna Kranti Vidyalaya and printed at The Parijat Printery Ahmedabad

Publication Date: June 28,1998

PRINTED MATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 12 Number 1 August / September 1998

A RARE FLOWER: Dr. Kusuma Soraba

The diminutive five-foot frame, thin as a reed, did not reveal the dynamo within. But in a crisis her gift of fight came in full force. If there was one characteristic of her I would list at the top, it was this: she was not one to accept limitations either in herself or others. She would want to push everyone to try and move higher. Not that she was ever unkind or inconsiderate. She just wanted everyone to aim higher and put in their best effort

'Snehakunja' - 'friendly nest', was her dream. The rural hospital, near Honnavar, by the ocean, has a history of personal sacrifice and determination behind it. Kusumakka (as we called her) came from a conservative rural middle-class family. An aunt of hers was a nurse and that was an exception for women in the family. With difficulty, she persuaded the aunt to prevail upon the family to send her to Bombay to train as a nurse. Though Kusuma's dream was always to become a doctor, she could see no possibility of that, due to economic reasons. However, permission for a nurse training was a good starting point to breakaway from home and bindings.

She worked very hard. Always eager to team more, she hung around dissections and autopsy performances, together with the medicos, whenever she could. This aroused the cariosity of a senior faculty member who helped her to learn more. He even suggested that she could try and do M B B S instead. The suggestion sowed the seed of a desire which slowly grew into a resolve. Typical of her, once resolved, nothing could stand between her and the aim. After she trained as nurse, she enrolled for M B B S and worked as a private nurse to support herself and her studies. No nurse was ready to be on night duty at the morgue in the hospital. Kusuma went on a satyagraha and got that assignment to get the needed income.

Kusumakka always kept an open scientific mind. She once told me this story: 'In the hospital where she studied, a big donation had been given to set up a high-tech (top-class) burn care ward. The ward was special with high charges. The patients were not allowed to eat normal food from home and were administered some sterile regulated hospital nutrition only. Contact with the family was also minimum in the ward, to avoid possible infection. Kusuma found that recovery of burn victims was better in the ordinary ward where patients had more family contact and ate normal home food, even when their bums were of a worse degree. Patients with far less serious bums too healed slowly in the special ward. When she pointed out this to the doctor in-charge, he said, "perhaps you are right But keep that to yourself. The grant and the ward are important to the hospital."

The callous treatment of poor patients and the appalling hygiene affected Kusuma deeply. During one of her fights on behalf of the patients, she had no time to look after her own eye infection. Though she was aware of the danger, she ended up paying the price - and lost her eye. In her suffering came her next resolution - to set up a rural hospital where the poor arc treated with respect and affection. With grit, she did her masters in surgery, with the ideal of saving rural lives.

Though a surgeon, her inclination was always towards natural health care. The patients were made to do yoga and pranayama on the beach or the hospital roof in the cool breeze of the dawn. They got massage, steam bath, mud packs, undertook fast or were administered ayurvedic medications. Allopathic medicines and surgery were the last resort at Snehakunja. All the "five-star" treatment was given to the rural poor for a symbolic fee, as Gandhi had envisioned.

A true feminist

The hospital was only a part of her work. Snehakunja trained young women and men in nursing, social work and struggles, gardening and environment protection. Kusuma's commitment to the cause of the environment broke all barriers. Moved by the rural poor's plight in selling the soil from the paddy-lands to brick kilns and the latter's destruction of the surrounding forests moved her to her first struggle against the series of brick kilns along the coast. She organised the people and educated them on the dangers of losing their natural resource base.

The environment movements had just begun in the State - against the various dams, the protest against Harihar Poly fibres denuding the forests, the Kaiga Atomic Power Plant... Everywhere, Kusumakka took her team of young women and men, writing and singing inspiring songs, shouting slogans, devising and acting street plays, she livened up all gatherings and rallies. Al the peak of the popular movement against the Kaiga nuclear power station, all the roads had been blocked and heavily policed to prevent the rally from reaching the site, undeterred by the gaping deep foundation pits, she jumped in and planted a peepul sapling. She had also asked the fishermen to reach the site by boats through the Kali river.

Sharavathy Valley was one she had saved many times, through dharnas and fasts. In a dramatic incident once she perched and sat on the drum containing the tenders called for clearing the forests for the Sharavathy Tail Race project. (This project had been stopped through a public interest litigation.) Once Kusumakka sat in a month long dharna together with teams of young women colleagues in the deep forest. Recalls one of those women, "...we were all women. In the middle of the forest, anything could have happened to us. It would have been easy for a bunch of rowdies to have intimidated and harmed us. But because of her name, none even dared to talk to us lightly."

Together with village women, Kusuma had started campaign against alcohol. Refusing bail, she spent six weeks in prison, spinning, writing songs and skits, involving and inspiring co-prisoners. Her time was demanded by not only the State level movements but also by national level movements. She kept pleading with friends to find doctors to look after her hospital work so she could be more free for total dedication to saving the environment. "Save Uttara Kannada District" (from the string of destructive projects) should be our campaign, she kept saying.

She was always too early a bird to be caught by the slow grinding wheels of the establishment: **When** the dome of the Kaiga atomic plant collapsed, she zipped across the 120 kilometres in the middle of the night, interviewed the workers and others and conducted her inquiry before the authorities woke up and closed off the place. One of the last concerns that tormented her much was the danger posed by the big crack in the Kodsalli dam- one of the huge dams near Kaiga. She trekked all over, together with the shepherds who had first sighted the gaping crack, took photographs and alerted the district authorities and the public. She convinced the Karnataka Power Corporation.

A demanding role model

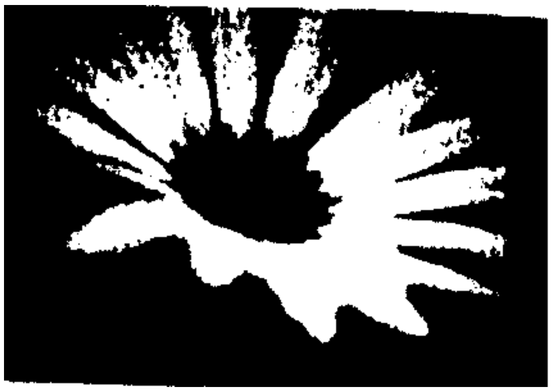
Kusumakka wanted her girls to be free, enterprising and fearless as herself. She wanted them to be always update and learn new things. Sometimes she would push them hard. Opportunities were offered to them to learn on hand. She loved animals dearly. Her cats and dogs ate with her. Her last acquisition had been a horse, she **wanted** to **be able** to go **to** remote villages, when needed, on horseback. She wanted **her** girls to **learn** horse-riding as well. She **had** declared once that three things were close to her heart, viz., nature, animals and mentally retarded children. She had done a **lot** for them all. The one-woman army had saved the Sharavathy Valley many times from the axe of the contractors.

The Valley, the forests will weep as will all the animals. The young women who might have been annoyed at having been pushed to do their best will slowly realise **that** a true friend and a role-model (if they wanted) is missing from their midst.

Kusumakka was not bound by others' rules - she made her own. Much to everyone's surprise, when she had passed 50, she adopted a baby boy. True to her expansive nature, she named him Bharath. She wrote and sang inspiring lullabies of universal love to little Bharath. Eight-year old Bharath's extraordinary mother is no more to lead him.

(For some lime now, I had been wanting to do a character sketch of Kusuma, to introduce her to a wider world. This writing had, in fact, been started when she was alive. But it seems fate had willed that the (lower (Kusuma means a flower) blush unseen by many. She was run-over and killed on the highway when she was returning from Bangalore on 14-3-98, after having consulted a lawyer to file a petition against the dam in the Sharavathy Valley. She was 61.)

K. Krpa



Rotblat: An exemplary man of the nuclear age

Jonathan Schell

In 1939 he initiated research on atomic weapons in Liverpool. England. In 1944 he came to the United States to work for the Manhattan Project. In December of that year—seven months before the weapon was first tested at Alamogordo and eight months before it was dropped on Hiroshima—he resigned his job. Rotblat had agreed to work on the bomb only because he feared that Hitler would win the war. He resigned when he learned that the German atomic bomb program had failed. When the peril that had justified his work on the bomb ended, he ended his work on the bomb. He was the only scientist working on the Manhattan Project to do so. His act provides lonely testimony to the capacity of human reason and will to overcome the powerful momentum of nuclear armament.

Today, the justification that Western nations gave themselves for possessing nuclear weapons—the Soviet threat—has ended and the question the entire West has to ask itself is the one Rotblat asked in 1944: When your reason for having nuclear weapons vanishes, do you end your work on them, or do you search for some new reason to go on? In the poem "Anthem for St. Cecilia's Day" W.H. Auden characterized modern man as the "impetuous child with the tremendous brain. "Rotblat, and Rotblat alone among the nuclear scientists in the months just before the advent of the atomic age, gave proof that it was possible for people to act with restraint and take moral responsibility for the products of that tremendous brain. After the war, Rotblat went to work to rein in and eventually eliminate the weapon he had helped to create. He became, among other things, a co-founder of the Pugwash Conference on Science and World Affairs, an international organization of scientists that has worked since its inception in 1954 to reverse the nuclear arms race, and it was for this work that he won the Nobel Peace Prize.

Why work an the bomb?

"My rationale was that the only way to stop Hitler from using a bomb against us would be if we also had it and threatened to retaliate. In other words, it was the concept of nuclear deterrence. I may have been the first person to develop this concept." Rotblat laughed at the thought. These days he derides the idea that during the cold war, nuclear deterrence prevented wars. "How many more wars are needed to refute this argument?" he asked in his Nobel acceptance speech. He also rejects the claim that deterrence stabilized the relationship between the two superpowers. "Neither side," he said to me. "was ever sure that it could destroy the other side after suffering a first strike. That is why each side kept trying to make its own arsenal more powerful and the other side's more vulnerable until they built the unbelievable number of some 80,000 nuclear weapons."

"What do you make now of the reasoning that led you to work on the bomb?"

"I often ask myself how I would behave if the same situation recurred. And, yes, I feel that I might make the same decision, although in several respects I was mistaken. First. I didn't know that the Germans had given up work on the bomb a long time before I quit. Second, I didn't realize that so-called nuclear deterrence doesn't work with people who are irrational, as Hitler was. I now think that if he had had the bomb he would have used it. And, third, I was naive in believing that once we scientists had produced a weapon, the military and civilian leaders would listen to us regarding how it should be used "

Degradation of Moral Standards

I asked why he thought the other atomic scientists had not acted as he had done once Hitler lost the war.

"I believe that war has a terrible effect on our behavior, on our moral standards," he answered. "One person who comes immediately to mind is Robert Oppenheimer. If you looked at his outlook on life, his philosophy, you wouldn't believe that such a man would advocate the use of the bomb on Hiroshima—on civil ians—and yet he did. He could have stopped, he could have said no, but he did not. and later on I found that his moral decay—in a way. his moral disintegration-had begun even before that, in 1943. You know that the first reactor came into being in December 1942 in Chicago. This was the first time it became possible to produce large amounts of strontium 90—the radio active fission product. He wanted to spray it on German soil, so as to poison the food and kill people. And there's a letter that he wrote in 1943 to (Enrico) Fermi, who was in charge of the reactor, saying that we should not begin the project unless we could produce enough (strontium 90) to kill half a million men. This was utterly barbaric It tells me that the war had affected him. It's one reason that I'm so much against war—not only because of the physical privation and suffering but also because of the mental breakdown."

No First Use

There are three areas in which Rotblat. who has written extensively on abolition (and edited a book. A Nuclear-Weapon-Free World, on the subject), has brought his attention to bear with particular insistence and force. The first is his advocacy of a nuclear no-first-use treaty—no-first-use being the policy that nuclear weapons should be dedicated solely to the mission of deterring other nuclear weapons. They should have no role in deterring conventional war, much less in actually repelling conventional attacks. If the pathways of escalation from conventional war to nuclear war were blocked, Rotblat has suggested, nuclear war would become less likely, but he advocates no-first-use for another reason: its role in making nuclear abolition possible.

"The most important step at the present time—and this can be taken virtually overnight—is for the nuclear powers to declare that the only purpose of possessing nuclear weapons is to deter a nuclear attack," he said to me. "If the nuclear powers can agree on this, and follow it up with a global treaty of no-first-use, this in my opinion would be the breakthrough we need. It prepares the way to go to zero, for if each nuclear power possesses nuclear weapons only to deter other powers' nuclear weapons, and all were to agree to eliminate them, then no one would have any reason any longer to retain them. And it is something that can be done without an extraordinary verification system. I would put it at the top of my list of things to do."

Unfortunately, he observed, the nuclear powers cling, overtly or tacitly, to other justifications for keeping nuclear weapons. As the Nuclear Posture Review and the new Presidential Decision Directive made clear, the United States deploys nuclear weapons to deter a potential threat from some future hostile Russia and to deter chemical or biological attacks by "rogue" states. Rotblat joins General Horner in arguing that a nuclear-weaponless United States, which would remain "the most powerful nation in the world," has less to worry about and more to gain from abolition than any other country.

Societal Verification

Still. Rotblat calls for the most stringent verification systems technically possible for any future abolition agreement. Of particular importance, he said, would be verification of commercially produced plutonium, whose global stocks are already far greater than the amount of plutonium that might be removed from decommissioned nuclear weapons. He has concluded that verification within a range of 99 percent accuracy might be possible. Still, considering the amount of plutonium in the world, even 1 percent is "too much, because even 1 percent would be enough to make many bombs."

This admission brought him to the second area in the field of disarmament in which he has taken a particular interest "We should establish a system of societal verification," he said. "In societal verification, citizens—including, especially, scientists—acquire a legal obligation to report on any efforts to build weapons of mass destruction." Any global abolition treaty should itself create the obligation. "A clause of the treaty would mandate all signatory nations to pass national laws that make it the right and the duty of every citizen to notify international authority of any effort to circumvent the treaty. This would apply especially to scientists. To make nuclear weapons you need two things. One is special equipment and the other is a certain brainpower. If violations are occurring, scientists will realize that something is going on. With this societal system of verification in place in addition to all the technical means, the chances of any nation building up a nuclear arsenal in a completely clandestine way, without its being detected, is extremely small."

World Without War

In connection with his work on verification, Rotblat has subjected the various possible forms of "breakout" to analysis. The most likely violator, he has observed, would be a former nuclear power. Such a power, however, certainly would be highly unlikely to circumvent an abolition agreement merely to confront a conventional threat by a smaller power. That leaves "the possibility of a political situation that deteriorates so badly between two great military powers that they feel compelled to resort to military measures, even leading to the use of nuclear weapons." However, such a crisis probably "would be seen coming for a long time." Even if "both sides start to rebuild their nuclear armories," the outlook, however ominous, would be "better than at the present time," in which nuclear powers already possess large arsenals on a hair-trigger. The likelier case would be a small power that "clandestinely" built up "a nuclear armory for aggressive purposes" Such a country would likely face "the combined conventional military might of the whole world " Under such circumstances, "no rational leader is likely to take such a risk for gains that are bound to be short-lived." There is, of course, the danger that an "irrational leader" or "fundamentalist regime bent on launching a holy war" might build nuclear weapons. The special difficulty in such cases is that a military reprisal might "not be a deterrent." On the other hand, such cases are "unmanageable now." Rotblat concludes that while the dangers of breakout arc real, taken together they are far smaller than the dangers we now run daily in our nuclear-armed world.

Rotblat's conviction that scientists should take responsibility for the consequences of scientific inventions leads him to a third area of concentration. He believes that although nuclear abolition need not await general and complete disarmament, it nevertheless should be seen as a way station to a world without war. "Even now," he said, "many people still feel that we can fight a nuclear war and get away with it. They don't realize that for the first time in history man has acquired the means of destroying his own species in a single action. But even the elimination of nuclear weapons will not bring full security. Nuclear weapons cannot be disinvented. Therefore it is true that in a military confrontation nations will be tempted to rebuild them. Also, while nuclear weapons are the first means man has developed for destroying his own species, they will not be the last. Scientists can invent other means for the full destruction of the species. It is already recognized that further research is likely to bring these means into being. In such circumstances, any war can threaten us, because any war can escalate without limit These are my reasons for believing that the long-term objective must be not just nuclear disarmament but a world without war.

"Of course, people say that this is Utopian, much harder than the abolition of nuclear weapons. I argue that if you look at the actual trend in history in recent years.

Continued on page 7

Winning the Right to Oversee

To settle a lawsuit brought by 39 environmental and peace organizations, the US Department of Energy (DOE) signed a landmark agreement which would increase public oversight of its efforts to address severe contamination problems in the country's nuclear weapons complex.

The settlement ends nine years of litigation charging that the DOE failed to develop its "cleanup" plans properly. The DOE had faced a contempt of court hearing for not complying with a previous legal agreement in the case.

Key elements of the settlement include: —Creation of a regularly updated, publicly accessible database including details about contaminated facilities and waste generated or controlled by the DOE's cleanup, defense, science and nuclear energy programs, including domestic and foreign research reactor spent fuel, listing characteristics such as waste type, volume, and radioactivity, as well as transfer and disposition plans. —DOE funding for at least two national stakeholder forums to assure that the database is comprehensive, accurate and useful. —Completion of an environmental analysis, with public input, of plans for 'long-term stewardship" at contaminated DOE sites to ensure protection of the public and the environment —Establishment of a $6.25-million fund for non-profit groups and tribes to use in monitoring DOE environmental activities and conducting technical reviews of the agency's performance. —Payment of plaintiffs' legal fees and expenses incurred to litigate this case. —Continuing federal court oversight to assure adherence to the agreement

"I'm really excited! This is a major victory both for the environment and for public participation;" said Marylia Kelley, of Tri-Valley CAREs in Livermore, California, one of 39 plaintiff groups. "We have won access to the tools the public needs to

Continued on page 7

The Race is Over

FREEMAN DYSON

A few years ago 1 walked into a room where there were forty-two hydrogen bombs lying around on the floor, not even chained down, each of them ten times as powerful as the bomb that destroyed Hiroshima. This experience was a sharp reminder of the precariousness of the human condition. It encouraged me to think hard about ways to improve the chances of survival of my grandchildren. Nuclear weapons remain, as George Kennan has said, the most serious danger to mankind and the most serious insult to God.

The disappearance of nuclear weapons from our thinking about the future is a historic change for which we must be profoundly grateful. Fifty years ago and for many years thereafter, nuclear weapons dominated the landscape of our fears. The nuclear arms race was the central ethical problem of our age. Discussion of the ethical dilemmas of scientists centred around bombs and long-range missiles. The evil face of science was personified by the nuclear bomb designer. Now, quietly and unexpectedly, the bombs have faded from our view. But they have not ceased to exist. The danger to humanity of huge stockpiles in the hands of unreliable people is as real as ever. Yet the bombs are not mentioned in our vision of the future. How could this have happened?

In the summer of 1995 I took part in a technical study of the future of the United States[9] nuclear stockpile. The study was done by a group of academic scientists together with a group of professional bomb designers from the weapons laboratories. The purpose of the study was to answer a question. Would it be technically feasible to maintain forever a stockpile of reliable nuclear weapons of existing designs without further nuclear tests? The study did not address the underlying political questions, whether reliable nuclear weapons would always be needed and whether further nuclear tests would always be undesirable. Bach of us had private opinions about the political questions, but politics was not the business of our study We assumed as the ground rule for the study that the weapons in the permanent stockpile must be repaired and remanufactured without change in design as their components deteriorate and decay. We assumed that the new components would differ from the old ones when replacements were made, because the factories making the old components would no longer exist. We looked in detail at each type of weapon ami checked that ils functioning was sufficiently robust so that minor changes in the components would not cause it to fail. We concluded our study with a unanimous report, saying that a permanently reliable nuclear stockpile without nuclear testing is feasible. Unanimity was essential

Unanimity was made possible by the objectivity and the personal integrity of the four weapons designers who worked side by-side with us for seven weeks, John Kammerdiener and John Richter from Los Alamos, Seymour Sack from Livermore, and Robert Peurifoy from Sandia. They are impressive people, master craftsmen of a demanding technology. They have spent the best part of their lives planning and carrying out bomb tests. They remember every test, whether it succeeded or failed. They know why each test was done, and what was learned from its success or failure. Their presence was essential to our work, and their names on the report gave credibility to our conclusions. They are survivors of a vanishing culture. They lived through the heroic age of weapon-building. They will not and cannot be replaced By working on this study, they unselfishly helped our country to move safely into a world in which people with the special qualities and talents of these four men will no longer be needed.

The conclusion of our study was a historical landmark, commemorating the fact that the nuclear arms race is finally over. The nuclear arms race raged with full fury for only twenty years, the 1940s and 1950s. Then it petered out slowly for the next thirty years, in three stages. The science race petered out in the 1960s, after the development of highly efficient hydrogen bombs. Nuclear weapons then ceased to be a scientific challenge. The military race petered out in the 1970s, after the development of reliable and invulnerable missiles and submarines.

More Trouble Than They Are Worth

Nuclear weapons then ceased to give a military advantage to their owners in real-world conflicts. The political race petered out in the 1980s, after it became clear to all concerned that huge nuclear weapons industries were environmentally and economically disastrous. The size of the nuclear stockpile then ceased to be a political status symbol. Arms control treaties were concluded at each stage, to ratify with legal solemnity the gradual petering out of the race. The atmospheric test ban of 1963 ratified the end of the science race, the ABM and SALT treaties of the 1970s ratified the end of the military race, and the START treaties of the 1980s ratified the end of the political race.

How may we extrapolate from this history into the world of the 1990s and beyond? The security and the military strength of the United States now depend primarily on non-nuclear forces. Nuclear weapons are on balance a liability rather than an asset. The security of the United States will be enhanced if all deployments of nuclear weapons, including our own, are gradually reduced to zero. For the next fifty years we should attempt to drive the nuclear arms race in reverse gear, to persuade our allies and our enemies that nuclear weapons are more trouble than they are worth. The most effective moves in this direction are unilateral withdrawals of weapons. The move that signalled the historic shift of the arms race into reverse gear was the unilateral withdrawal of land-based and sea-based tactical nuclear weapons by President Bush in 1991. Chairman Gorbachev responded quickly with similarly extensive withdrawals of Soviet weapons. The testing moratorium of 1992 was another effective move in the same direction.

To drive the nuclear arms race further in reverse gear, we need to pursue three long-range objectives: world-wide withdrawal and destruction of weapons, complete cessation of nuclear testing, and an open world in which nuclear activities of all countries are to some extent transparent. In pursuing these objectives, unilateral moves are usually more persuasive than treaties. Unilateral moves tend to create trust, whereas negotiation of treaties often tends to create suspicion.

Our nuclear stockpile study fitted well into the context of the reverse-gear arms race. The purpose of the study was to achieve a technical stabilisation of our stockpile, to clarify what needs to be done to maintain a limited variety of weapons indefinitely without testing. Stabilisation is the essential prerequisite for allowing the weapons to disappear gracefully. Once a stable regime of stockpile maintenance has been established, the weapons will attract less attention both nationally and internationally. They will acquire the qualities that a stable nuclear deterrent force should have: awesomeness, remoteness, silence. Gradually, as the decades of the twenty-first century roll by, these weapons will become less and less relevant to the problems of international order in a hungry and turbulent world. The time may come when nuclear weapons are perceived as useless relics of a vanished era, like the horses of an aristocratic cavalry regiment. maintained only for ceremonial purposes. When nuclear weapons are generally regarded as absurd and irrelevant, the time may have come when it will be possible to get rid of them.

Abolish War

The time when we can say goodbye to nuclear weapons is still far distant, too far to be clearly envisaged, perhaps a hundred years away. Until that time comes, we must live with our weapons as responsibly and as quietly as we can. That was the purpose of the stockpile study, to make sure that our weapons can be maintained with a maximum of professional competence and a minimum of fuss and excitement, until in the fullness of time they will no longer be considered necessary. In the meantime, the ethical dilemmas concerned with non-nuclear weapons and non-nuclear warfare remain unresolved.

The abolition of war is an ultimate goal, more remote than the abolition of nuclear weapons. The idea espoused early in the nuclear age by Oppenheimer, that the existence of nuclear weapons might lead to the abolition of war, turned out to be an illusion. The abolition of war is a prime example of an ethical problem that science is powerless to deal with. The weapons of non-nuclear wan guns and tanks and ships and aeroplanes, are available on the open market to anybody with money to pay for them.

Science cannot cause these weapons to disappear. The most useful contribution that science can make to the abolition of war has nothing to do with technology. The international community of scientists may help to abolish war by setting an example to the world of practical co-operation extending across barriers of nationality, language, and culture.

Freeman Dyson
From a talk delivered at Harvard College on March 6, *1997*

■ **Rotblat** (continued from page 4)

you find that we are half-way there—or perhaps more than half. In my own lifetime I have lived through two work) wars and in both of these France and Germany were the principal antagonists, mortal enemies, and yet in the course of a few decades the idea of France and Germany going to war became inconceivable. In Latin America, only a few years ago, most governments were dictatorial military regimes. Now, except for one or two countries, they are democratic and no longer talk about fighting one another. The main enemy now is poverty, which we don't need a war to fight"

■ **Winning...** (from page5)

monitor the DOE's compliance with the nation's obligation to address the radioactive and toxic legacy of nuclear weapons production". "DOE is currently gearing up ils nuclear weapons research and development activities—the same kinds of activities that created this environmental disaster Now, for the first time, using the DOE's own data, we'll be able to demonstrate the link between cause and effect, a powerful argument against any further nuclear weapons design and production."

Many of the groups first sued the DOE in 1989, claiming that the agency must conduct a thorough analysis before moving ahead with plans to address the radioactive and toxic legacy of nuclear weapons production and modernize its facilities. The next year, the DOE signed a legal agreement promising a full public review of its proposals. In 1994, however, DOE leaders decided to abandon the Environmental Restoration Programmatic Environmental Impact Statement process without consent of the plaintiffs.

Source: Press release of plaintiffs. 14 December 1998

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Nuclear South Asia: 'Now I am become death'

A View From Bangladesh

Imtiaz Ahmed

With both India and Pakistan conducting a series of underground nuclear tests in May 1998, two of the South Asian countries joined an exclusive Club whose behind-the-veil motto was best summed up by Robert Oppenheimer, the father of US atomic bomb. On seeing the first atomic explosion at Alamogordo, New Mexico, on July 16, 1945, he said: "Now I am become death, the destroyer of worlds!" The question now is, will India and Pakistan's joining the exclusive Club change South Asia? The question deserves serious considerations not so much for reasons of military strategy or technology as for what it has done or is likely to do to the South Asians socially and psychologically.

Oppenheimer's statement, incidentally, *is* a direct quote from the Bhagavad Gita Until the first test at Pokharan in 1974, I, as a member of the South Asian community, took solace from the fact that Oppenheimer sought refuge in the wisdom of the East in highlighting the follies of the West. Little did I realize then that Oppcnhcime's spontaneous remark carried no weight on the people in the midst of whom the wisdom, or rather the cautionary note, had originally developed. But then, there was no reason why it ought to.

Bedeviled by Modernity

South Asians were bedeviled by modernity long before the modern West became nuclear. A precise kind of modernity, however, look roots in this pan of the world. Largely as a result of the colonial experience. South Asia by the beginning of the twentieth century became, what Nirad C. Chaudhuri sarcastically referred to as,'the provincial edition of the civilisation of Europe, palely reflecting like the moon, its borrowed light from the great sun beyond/ This was as true in politics and economics as it was in science and technology. Nuclear development, therefore, was a logical culmination of India and Pakistan's craze for developing their respective national states in the image of the modern West.

To put the current debate in a proper perspective, India's policy to go nuclear had little to do with China's nuclear development. In fact, India's nuclear programme is a pre-independence thing, with the Indian Board of Atomic Energy Research being established as early as 1946 under the able modernist, Bomi J. Bhabha Countries now point out that even the otherwise pacifist Nehru was so impressed by Bhabha's atomic quest that soon after independence he wrote to his Defence Minister Baldev Singh that not only did the futurc belong to those who produce(d) atomic energy,' but 'Defence (was) intimately connected with this.' A modernist, and more so a dependent one, could hardly have thought differently. The first Pokharan test, for that matter, came in the wake of India's long, somewhat overdrawn, investment on nuclear R&D. In this sense, there is hardly any difference between the so-called secular Congress, under whose auspices the first test in 1974 look place, and the communal BJP, which gave the green signal for the tests in May 1998. Both chose to nuclearize India and fashion its development in the image of th modern West. Friends and foes of nuclear India, both within the country and beyond, were all mesmerized

There were good reasons for the BJP to make the event an expression of Hindutva and Indian nationalism. The two, indeed, became synonymous, and that again, almost officially, once the BJP was voted into power. In fact, policy-watchers in Delhi now point out that the BJP gave the green signal to Kalam and his team the day they won the confidence vote in the parliament. There is some merit in this observation, particularly in view of the heavily leaked secret that the tests were to be carried out before the CTBT deadline of September 1999, lest investment on nuclear R&D become difficult to carry through. Timewise, therefore, the BJP ought to be credited only for making the best of it. But then, why BJP and not Rao, Gowda or Gujral?

In the post-independence phase, the fervour of 'Indian nationalism,' particularly within the majority community, could develop and prosper only by way of advocating it as Hindutva- nothing more, nothing less. Not surprisingly, therefore, the minority communities in India are advocating not 'Indian nationalism' but other brands of nationalism or sub-nationalism, for instance, 'Assamese nationalism,' 'Muslim Kashmiri nationalism, 'Sikh nationalism,' 'Naga nationalism/ etc. For Rao, Gowda or Gujral, therefore, the nuclear tests could not have been made a part of 'national resurgence' or 'Indian renaissance/ lest these be taken as fuelling 'Indian nationalism,' whose other name is Hindutva within the majoritarian community. Devoid of the CTBT compulsion (that is, if we take September 1999 as the deadline), Rao, Gowda or Gujral could have gone for an early test, but this would have required desecularizing their respective parties/coalitions thoroughly. For all three, such a policy option was very difficult to undertake particularly when their entire life had been devoted to the enhancement of secularism or secular politics in India. The BJP had no such hang-ups.

A lot has been made of BJP's election manifesto and how they remained true to their long-advocated policy of making India a nuclear power. Less understood here is the fact that for a communal party like BJP this is all that matters. In so far as it is directed towards an alien power or nation, 'national resurgence' in the post-independence phase is less meaningful for the secularists but not necessarily for the communal forces. In fact, the respective position of the two on the issue of 'national resurgence' is quite the opposite during the colonial or pre-independence time. Knowing well that the nuclear tests would result in a national euphoria, which would only give credence to Hindutva and the power of BJP, the latter could ill afford to lose time, whether on grounds of coalition politics or still-to-come CTBT compulsion. Post-independence nationalism, given its inherently communalized and fragmented nature, quite justifiably came to rest on the deadliest machine on earth - nuclear power! In the process, however, the follies of the secularists were thoroughly exposed.

Immediately after the BJP-led nuclear test, Gujral, Gowda, Sonia, even influential Left politicians, all joined the post-test euphoria. In fact, Gujral and some members of the Congress went to the extent of claiming a share in the national pride. If there was any difference in their response it was restricted to congratulating the nuclear scientists and not the government or taking exception to BJP's position that India did it for China! In the public mind, however, their joining the euphoria simply amounted to congratulating Vajpayee and his 'courageous' government. Much of this, however, changed (and here lies the follies of the secularists) following Pakistan's nuclear test. A somewhat vibrant criticism of the BJP-led nuclearization of South Asia is now in full swing, but then BJP has already scored its points. Economic hardship and an out-and-out recklessness of the leadership can now only derail BJP's political gain.

Pakistan's response was predictable, although many in India, including some nuclear scientists, thought that Pakistan was bluffing. It did not take long for Indians to realize that no exceptional merit nor another Einstein is required to produce nuclear bombs. What is required is sheer drainage of resources and transferring/smuggling nuclear technology/materials. The hyped-up photo sessions of Kalam, Qadeer, and the like, were somewhat pathetic, almost paralleling the mythicized hero of a Bollywood/Hollywood sequence!

Again, to put the debate in a proper perspective, Pakistan's nuclear programme developed independent of India's, although it is Une that its tests were a direct response to India's tests. The 1974 Pokharan test did accelerate the process, but the nuclear programme in Pakistan had a much older history. In this context, the pro-Nuke community in Pakistan was probably put in a better position by way of having India as its enemy for it could easily impress upon many in the world to supply the much-required nuclear technology or at least tolerate Pakistan's nuclear programme. The hostile situation also allowed successive governments, both Pakistan and India's, to impress upon the people the need for spending a large amount of government money for nuclear development. Whether the bulk of the people of both India and Pakistan have become strong and more secured or poorer and insecure as a result of their respective nuclear tests remains an open question. Some other consequences, however, arc more predictable. For the sake of easy retention, I will enlist them under 4 S's.

1. Secrecy. Nuclear R&D have always been carried out under utmost secrecy. In practice, therefore, it remains incompatible with the openness required of a democracy. Any suggestion to the contrary is bound to kill either democracy or the state of nuclear secrecy. In fact, before the advent of high-tech x-ray machines, even nuclearscientists were required to stand wholly naked for inspection before entering their otherwise highly secured nuclear labs. Put differently, the first victims of a nuclear programme are not the enemies against whom it is carried out but rather the nuclear state's own people. One Pakistani critic, in the backdrop of the post-test Emergency declared by Sharif, commented: 'the state of emergency continues with all fundamental rights suspended. The

irony of the stale turning against the very people whose lives its securing through nuclear weapons is too much for me.' India's case is no different either. I will return to that shortly.

2. Smuggling. Post-nuclear India and Pakistan will experience Western/Japanese sanctions of one kind or another. There is no escape from it Such sanctions, however, must not be understood in the regular 'economic' sense of the term. While it is true that the transfer of high/super technology to India and Pakistan would be thoroughly discouraged/restricted for many years to come, the more routinized form of sanction will be the monitoring of South Asians, particularly scientists, entering or residing in developed countries. We already got a glimpse of that when an Indian American was made the scapegoat for the US intelligence failure(!) to detect the preparation leading to the Indian nuclear tests. Surprisingly, Pakistan carried out the tests when all the US satellites were telescoped to the test location, although none ventured to say that the US intelligence failed once again! Why invent an Indian American scapegoat in India's case, unless it is meant to question and sanction the professionalism of South Asians working in the US! But then, like sanctioning goods, sanctioning people for high-tech or nuclear technology know-how could lead to things not envisaged by the progenitors of sanctions. What I have in mind is the smuggling of technology know-how, more so in circumstances where there is a genuine demand yet there is restrictions. Put differently, nuclear development, given its horrific nature and pricy investment, reproduces a culture of smuggling, where nuclear bombs may not be smuggled but things connected to the development of nuclear bombs, including other more sophisticated conventional weaponries, are bound to be smuggled.

More at home, sanctions are bound to activate unregulated trade or smuggling across South Asian bottlers. Already critics are pointing out that both India and Pakistan are busy establishing "bogus trading bodies' in non-nuclear South Asian states to overcome Western/Japanese sanctions. Whatever may be the merit of this argument, given the porous nature of South Asian borders, it would be quite a task for the West/Japan to enforce sanctions against India and Pakistan. This must not be taken to mean that India and Pakistan will not be hurt by the sanctions already imposed nor non-nuclear South Asian states will desist from taking advantage of the situation by gearing up their own trades with both sanctioning and sanctioned powers. A sizeable section of this trade will, of course, be in the form of smuggling.

3. Small Arms. With the balance of nuclear terror in place, insurgent/sub-nationalist groups in South Asia will increasingly take recourse to small arms. A proliferation of the latter on a much grander scale is bound to happen. It would simply be a folly to think that suppressed individuals or dominated groups would give up their life-long struggles just because two South Asian states went nuclear! Without the option of a direct war now that both arc declared nuclear powers, there will be a temptation on the part of both India and Pakistan to help each other's dissenters by way of channelizing small arms through unregulated channels. As with the smuggling of goods, the illegal flow of small arms is bound to create ruptures within both nuclear and non-nuclear South Asian states. No nuclear bomb can stop the sub-national aspirations and the corresponding violence, whether of Kashmiris, Beluchis, Muhajirs, Assamese, Sikhs, and many others throughout South Asia. In this context, it is worth pointing out that the Soviet Union broke down at a moment when it had stockpiled thousands of nuclear bombs and that again, not just in kilotons but also in megatons!

4. Psychotic. There are various aspects to this. I will highlight only two. Firstly, a sense of paranoia takes hold of the nuclear state. We have already referred to Pakistan's post-test Emergency. In India's case, the paranoia seems to have taken roots without the support of an official decree. To give one example, at a post-test Afro-South Asian conference on 'national identity' at a city in Kerala (India), not only the entire batch of Pakistan delegates were refused visa but more interestingly. Home Ministry officials turned up at the venue and demanded not one but three copies of all papers to be presented at the conference! Even Indian delegates were thoroughly puzzled by the demand and quietly referred to it as a post-test syndrome.

Secondly, far from being awed by the 'scientific' achievement, most members come to nurture some kind of revengeful or killing mentality. This is particularly true with respect to children's response to the event. I found many Bangladeshi school goers, for instance, who busied themselves in pencil-drawing nuclear bombs for their own country! I also found adults talking about 'other kinds of bombs' or 'newer and more modernized military strategy' to counter the nuclear threat Indeed, so borriftc is the thing that the mind can hardly think anything beyond horror to rectify the thing. Nothing can be more dangerously pathetic.

The 4 S's are all pernicious not so much for informing and influencing the slate as for reshaping and reproducing the already polarized and violent civil society The further these make their way to the latter, the quicker we all will be living in the nightmarish world of Oppenheimer. The 'death,' for that matter, has entered our imagination and activities, indeed, in a more rotten way than the divine had originally planned. The only consolation at this stage is that with this stale of mind and living, the friends of nuclear weapons can go no further. On the other hand, the foes of nuclear weapons can now join hands not only within their own territory but also across national boundaries. Let us in the process of joining hands bury the nuclear-reproducing 'nation stale' and create a space for a post-nationalist state of living.

llmtiaz Ahmed is Associate Professor of International Relations, University of

The bomb and after

A Pakistani View

Tahira Mazhar

WAS it necessary to explode a bomb to satisfy ourselves as being equal to India? Were we in a position to use the same tactics as India? What has happened now? How has our dignity been enhanced by having to impose an emergency and having the rupee plunge and looking for a bail out?

We were told constantly by our foreign minister, our information minister and our finance minister that if sanctions were imposed on us, we were prepared for them and these would not have any serious effect on us. The prime minister very confidently told Pakistanis in Manchester: "Pakistan is not afraid of any economic sanctions. These sanctions are a blessing in disguise as these will help the nation to stand on its own feet and become self-reliant."

Why are we now talking of dwindling foreign exchange reserves and seeking IMF aid? Every week the State Bank issues new orders and those who brought back their foreign currency to put it in their own banks because they trusted the Nawaz Sharif government arc now holding him responsible for the mess. This is one aspect of the present scenario.

Mr Nawaz Sharif during his election campaign had promised easier trade with India and cooperation in other fields. But today he seems helpless and like others talks of nothing but Kashmir. Of course the Kashmir issue should be solved, but it must be solved with the cooperation of the Kashmiri people. Many of them, it is said, want an independent Kashmir. Are we prepared for that? We must not become a hostage to the Kashmir issue, and go ahead with other problems facing the two countries. This is what Mr Nawaz Sharif talked about during his election days. I think Mr Sharif is also a hostage to a coterie of people who are against any negotiations with India. He must pick up courage and face them so that both our countries can move further towards progress and peace.

It is high time we recognised our own nation. We are not a nation which can make sacrifices. We do talk and our Press talks even bigger but when the time comes, there are not many who are prepared to do anything concrete. So let us not depend too much on the people. Of course they can be forced to sacrifice, but is it really sacrifice for the sake of safeguarding the country or to protect the power politics of the ruling coterie?

Tahira Mazhar
DAWN Group of Newspapers, 1998

Andhra Pradesh Police tries to gag popular expression against nuclearization

The first casuality of nuclear weapons is concience. The second is democracy.

Andhra Pradesh based Organisation for People's Democratic Rights (OPDR) had invited me to speak at a meeting in Hyderabad held on 9th of August to commemorate Nagasaki Day. This well attended public meeting was held in a centrally located large hall called Ambedkar Bhavan. The meeting was followed by a rally which passed off peacefully without any instance of violence or any disturbance whatsoever.

For the meeting the organisation had published a pamphlet in Telungu and a programme notice in English. This material was pasted in public places like bus stops, walls of public offices, etc.

The Saifabad unit of the Hyderabad city police found these notices an intolerable disfigurement of the beautiful city of Hyderabad and have launched a case against Mr V Narayan Reddy who is an advocate and organising secretary of Hyderabad unit of OPDR. The case (Crime No. 376/98) has been registered under section 3 of Andhra Pradesh Prevention of Disfigurement of Open Places and Prohibition of Obscene and Objectionable Posters and Advertisment Act.

If the police were as zealous and determined in launching prosecutions against all pasting of posters and notices that disfigure the beauty of Hyderabad it would indeed be commendable. However, one finds the place crawling with posters of film advertisments and notices of various 'acceptable' political parties. Perhaps the police find that these posters enhance the beauty of Hyderabad.

Selective application of laws especially against political opponents leads to the suspicion that the prosecution is not meant to preserve the beauty of Hyderabad's official buildings but is an attempt to suppress expression of views contrary to government thinking. When these views are being expressed against so obscene and objectionable activity as the nuclearisation of India, it is indeed a travesty of the fundamental right of freedom of expression enshrined in the Indian constitution.

The High Court of Andhra Pradesh has already granted Mr Narayan Reddy a stay in the proceedings against him. However, letters to the cyber-savvy Chief Minister Mr Chandra Babu Naidu protesting against this might well be in order.

Surendra Gadekar

Anti-Tests' Protests on Hiroshima Day

Hiroshima and Nagasaki day commemortations, have normaly been somewhat of a ritual Usually there is a politician or a bureaucrat lecturing bored school children about the borrors of atomic war and shedding metaplnricol tears in rememberance. Not this year The tests at Pokharan and in the Chagai hills ensured that all such crocodiles remained indoors while the message of Hiroshina was brought close to home. There were some large demonstrations in the metros, but more relevant were the demonstrations and awareness raising programmes in small towns and even in some villages At nuclear India. Below we have given a brief description of some of these protests.

Calcutta

In one of the biggest anti-nuclear demon stration held anywhere in the world, over 400,000 people marched along the streets of Calcutta to register the impassioned protest of the masses against the policy of nuclear weaponisation. The march which lasted for more than three hours was convened at the call of 66 mass organisations.

The procession was interspersed with a variety of tableaux which depicted the terrible fall-out of nuclear explosions. Some portrayed the horrors that continue to haunt the world in the wake of the nuclear attacks by the US in 1945 on Hiroshima and Nagasaki. Various organisations presented models of the kind of all-pervasive pollution that affects humanity even when comparatively 'smaller' nuclear devices are exploded, whether above the ground, below the ground, or under water.

The procession also included bands of tribal people from most of the twelve districts of south Bengal from where massive processions came to Calcutta from very early in the morning of 6th August In their own, unique manner, the tribal song-and-dance ensembles voiced their protest against all kinds nuclear 'experiments' that would ultimately harm the green earth and the people who inhabit it The variety of the performances and the colourful costumes and masks that they wore attracted a lot of attention.

The procession that started from the Netaji Indoor stadium and from several other points of the city, traversed central Calcutta, criss-crossing the main thoroughfares many times before ending in a huge-rally at the Park Circus maidan. Songs, dances, mimed-plays, street-theatre, recitations, on-the-spot paintings marked the progress of the marchers. Just before the beginning of the march, a convention was held in the packed-to-capacity Netaji Indoor stadium. The convention was addressed, among others, by the writer Sunil Gangopadhyay, the poet Sankho Ghosh, the film director Mrinal Sen and others.

New Delhi

Shouting slogans and carrying placards proclaiming We Want Bread Not Bombs, No More Pokhrans, No More Hiroshima-Nagasakis and No Weaponisation, No Deployment thousands of people including a large contingent of school children wound their way from behind the Red Fort through the main streets of Old Delhi in an impressive Citizens March Against Nuclear Weapons.

The march culminated at the Feroze Shah Kotla grounds where a resolution was read out in Hindi and English by veteran Gandhian Nirmala Deshpande and historian Romila Thapar. Prominent personalities from different walks of life participated in the march including writer Arundhati Roy, social scientist Rajni Kothari. journalist Kuldip Nayyar actor Raj Babbar. Artists, acaedemics, writers, college and school students, workers, and activists of mass organisations came out in full force to lend their voice against the nuclear madness that threatens to envelop the subcontinent.

The resolution adopted at the rally noted that the tests carried out in May 1998 and the consequent provocative rhetoric "have only heightened tensions in the region, worsened relations with our neighhours and undermined popular initiatives aimed at forging peace among the people of the region" It said. "Both India and Pakistan now have the capability to perpetrate the horrors of Hiroshima and Nagasaki on each other, not once but many times. Therefore, the need to remember August 6 Hiroshima Day is particularly important. The people of India and Pakistan must stop this madness which threatens us with mutual annihilation.*[9]

The resolution also asserted that India must continue to vigorously campaign to dismantle the global discriminatory nuclear regime and initiate moves towards global nuclear disarmament. The nuclear weapons powers, despite all their pious pronouncements about dismantling their arse nals, have made only marginal efforts to do so. Pointing out that their imposition of sanctions against India and Pakistan is hypocritical, the resolution said if they are

serious about non-proliferation, they must pursue a credible programme for destruction of nuclear weapons globally, starting with their own. It added, "In order to resume India's due role, India must return to the global nuclear disarmament agenda and stop any further measures towards induction and deployment of nuclear weapons. Pakistan too must reciprocate with matching measures."

Chennai

A Committee Against Nuclear Weapons, called for a massive Human Chain starting from Parry's Corner - a key gathering point near the city's central bus terminus - to the Central Railway station, a distance of nearly three kilometres, on the evening of August 6, 1998.

The popular response surpassed the most optimistic expectations of the organisers. From 5 to 6pm in the evening on August 6 more than 5000 people lined up along the entire route from Parry's Corner to Central station. The composition of the crowd was as interesting as its size was impressive. There were at least two to three hundred children, a sizeable contingent of women and a not insignificant number of senior citizens.

Mumbai

More than 2000 demonstrators took part in a Silent Procession from Azad Maidan to Hutatma Chowk. The programme was organised by a "'Citizens Committee for Commemoration of Hiroshima and Nagasaki". More than 50 orgnisations including the Left parties, trade unions, Gandhians, progressive women's organisations, artists, intellectuals, environmentalists, civil liberties organisations, students and youth organisations and many voluntary organisations had constituted this Committee.

In addition to this Peace March, many local programes were held in different parts of Mumbai. Public meetings organised by Bombay Sarvodaya Mandai and lectures in colleges, along with showing of educational films like "Prophecy" are also taking place involving several thousands of students and members of the public.

Thousands of people in the state capital Agartala and in the North Tripura headquarter, Kailashar marched the streets on August 6 afternoon to assert the predominance of peace and amity over the forces of fissiparousness and warmongering on earth, marking the occasion of Hiroshima Day in Tripura. The main procession originating from Umakanta Maidan was preceded by a brief function consisting of revolutionary songs and invocatory addresses.

Lucknow

A meeting was held at the Ganga Prasad Memorial Hall in Lucknow which was presided over by K.N. Kakkar, well known literary personality. The meeting was addressed by Medha Patkar, and Professor A.P. Shukla..CPI(M) polit bureau member Sitaram Yechury and socialist leader Raghu Thakur also spoke.

Thiruvananthapuram

In Thiruvananthapuram, the capital of Kerala state, a three hour long programme from 10.30 am was held at the Martyrs Memorial at Palayam attended by thousands of people. The programme included songs, skits, speeches and exhibitions against nuclear weapons. The programme was organised by the A.K. Gopalan Study Research Centre. Posters, placards and banners condemning the use of nuclear weapons were put up all over the city. The programme began with a speech by Jubha Ramakrishna Pillai, the oldest surviving freedom fighter in Kerala. Students of the Model High School held up a huge banner with the words "We Share the Sorrow of Hiroshima". Well known historian K.N. Panniker released a poster with the words in Malayalam meaning —"Resist the Bomb — Or There Will be No Tomorrow:"

Almora

Five non-governmental organisations together orgainised a march in Almora town and gave a memorandum to the district collector. There has also been a continuous programme of education on the subject in schools and colleges in the area.

Udaipur

A number of different organisations of Udaipur area including Seva Mandir, Rajasthan unit of People Union of Civil Liberties amongst them had together sponsored antinuclear events which included a large rally and many meetings. Dr Sanghamitra from the Anumukti team had come as one of the invitees. These events were well covered in the local press. In her speech, Sanghamitra stressed the close relationship between nuclear weapons and the nuclear energy programme saying one was the mother of the other. Ex foreign secretary Jagat Mehta in his speech said that real security is only possible by removing poverty, ignorance and disease and not through engaging in an arms race.

Itarsi

The Kisan Adivasi Sangathan of Kesla had organised a silent procession in Itarsi and also issued a factsheet on nuclear issues in Hindi to commemorate Hiroshima day. The fact sheet which is in a question and answer format tries to counter many of the commonly encountered propaganda and misinformation on the nuclear issue.

Other Events

There were many other places where there were similar events and demonstrations. In our neighbourhood itself at Valod there was a rally with about a thousand participants. One thing that we at Anumukti did was to bring out a Hindi edition of Anumukti This has been well received and we intend to continue to bring out more material in various languages so that information about this issue no longer remains the preserve of a few who are literate in English.

IS ACCDDENTALNUCLEAR WAR IMPOSSIBLE?

Dr. Pervez Hoodbhoy

By the decree of Pakistan's Foreign Minister, accidental nuclear war between Pakistan and India cannot occur. In a statement to the APP on November 29, Mr. Sartaj Aziz said emphatically "I see no possibility of an accidental nuclear war between Pakistan and India. Pakistan has an effective command and control system".

This categorical statement is shockingly unscientific because it presumes complete fore-knowledge of all future crises and exigencies, a complete understanding of all the possible mechanisms that could lead to a nuclear exchange, and complete confidence in India's command and control system as well as that of Pakistan's. Further, it asserts that human error misjudgement, and miscalculation are impossible. Unfortunately, not a single assertion or presumption is logically or scientifically sustainable. On the contrary, there have been numerous tragic incidents in India and Pakistan that prove accidents and miscalculations are far from rare. At best the Minister could have argued that the probability of accidental nuclear war is small. Even though this assertion too would have invoked many questionable assumptions, nevertheless it could have been defended with some degree of plausibility. As it stands, however, the statement is factually and scientifically wrong.

It is not my intent to split hairs on an abstract academic discussion of the improbable versus impossible. The issue is far too serious for that.

One need merely note that nuclear war by accident was never derided and dismissed during the years of US-Soviet nuclear confrontation. On the contrary, both sides took this possibility very very seriously. To avert a false move during those five long decades, the two giants spent trillions of dollars acquiring the most sophisticated forms of intelligence gathering by satellites, aircraft, ships, and submarines. The data from these were continuously analysed using computers equipped with artificial intelligence programs. This enabled both sides to know each other's level of readiness for combat, and know in advance preparations for a nuclear strike. Without such an elaborate command and control system a doomsday nuclear confrontation may well have occurred out of fear or suspicion.

Of course we know that a US-Soviet nuclear war did not occur, but the danger had never been far away. In spite of every possible precaution — and technology far more advanced than India or Pakistan can even dream of — false information provided by radar and other detection systems was a nightmare for the US and Russian militaries. There were several serious false alarms causing much alarm, and this is true to an extent even today. For example, it has recently become known that on 25 Jan 1995 the Russians mistook a Norwegian scientific rocket for Trident sea-launched warheads. This mistake lasted for a full eight minutes - only two minutes away from the launch of Russian nuclear missiles, which are ' launch-on- warning'. Today there exist fears that although a nuclear launch is meant to be authorised by the Russian President, the Defence Minister and the Chief of General Staff of the Armed Forces, and subsequently by three officers at *the* missile sites, nevertheless this chain of command can be bypassed. Russian officers have been known to re-wire their systems to circumvent this and some may have the ability to launch autonomously. It has also been reported that sometimes only one officer remains on duty with the two keys and the button at his disposal.

There are lessons here for all who care to learn from the experience of others First, even the best technology is not good enough when the issue is whether or not to use nuclear weapons. Second, human intervention — either through mal-intent, ideological fervour, inexperience, or plain stupidity — can render the best plans and technology impotent. The Pakistan-India nuclear confrontation brings a special urgency to both sets of issues

It is common to assert that since the US and Russia, each with tens of thousands of weapons, were able to survive the Cold War therefore there is no reason for Pakistan and India, which have far fewer weapons. to feel alarmed. This is wrong reasoning. What may have been considered good enough for preventing accidental US-Soviet war is simply not good enough for us Having a common border, and with subcontinental missile trajectories of only 4-8 minutes, any type of early warning system is useless. Even if the best satellites, cameras, and computers in the world were miraculously made available to Pakistan and India, this would achieve nothing. In this ridiculously short lime it is totally impossible to make a rational decision as to whether the alarm is genuine, and whether the incoming missiles are to be presumed as nuclear armed.

Because no early warning system against nuclear-armed aircraft or missiles is possible, and because there is no way for Pakistan or India to protect their respective command and control centres, there is one and only one possible course of action. This is to disperse and deploy nuclear-armed aircraft and (when available) missiles over as wide a geographical area as possible under the command of separate military units. Further each unit must necessarily be provided the necessary authorisation codes for arming and launching the nuclear weapons in its possession.

Without providing autonomy to nuclear-armed military units, dispersal makes no sense — a single bomb on the Rawalpindi GHQ would knock out Pakistan's ability to mount a retaliatory strike. Even if the GHQ, or some other command and control centre, were somehow fortified to survive a nuclear blast in the vitinity, the electromagnetic pulse which accompanies a nuclear blast would destroy all normal telecommunications.

Hence autonomy of military units is an inescapable requirement for maintaining a credible deterrent. But, at the same time, this has a frightening cost because each unit, and not the PM and COAS, would have the final say in launching a nuclear strike against India. Could some ideologically charged Hindu-hating unit commander take destiny into his own hands? Could deliberately falsified or "honestly wrong" information reach a unit and result in ils launching the weapons in its possession? No one really knows, but the chances are certainly not zero.

One could make a virtually identical argument about India. While it is true that India is much larger, and Pakistan has fewer nuclear weapons, the difficulty in setting up an Indian command and control system that will not fail is almost equally severe. It would be stupid to concentrate-all nuclear decision-making in Delhi, and hence dispersal of nuclear forces is equally important for India. But the problems of dispersal are equally severe as well, and the possibility of accidentally initiating nuclear war from that end exists to a similar degree. We have no right to presume that the Indian command and control system is any more reliable than ours is.

Are these fictional, exaggerated, fears? I wish it were so. But the truth is that accidents, sabotage, and tragedy have frequently haunted our two countries. India has seen the terrible Bhopal gas tragedy. numerous nuclear reactor mishaps, dam collapses, and industrial accidents. Pakistan has seen many tragedies too.

It was but ten years ago that an unending stream of shells and rockets rained down from the skies of Rawalpindi and Islamabad, killing about a thousand people and wounding and maiming many times that number. The immediate reaction of most people around me, with whom I watched this awesome display from my university 10 miles away, was that it was an Indian attack. Others said that Kahuta had exploded. The government behaved like a chicken with its head cut off and went around in circles. It was much later in the day that Radio Pakistan admitted that an ammunition dump, located in the heart of the city, had blown up. To this day, no official report of the Ojhri Camp disaster has been made public and the cause remains secret.

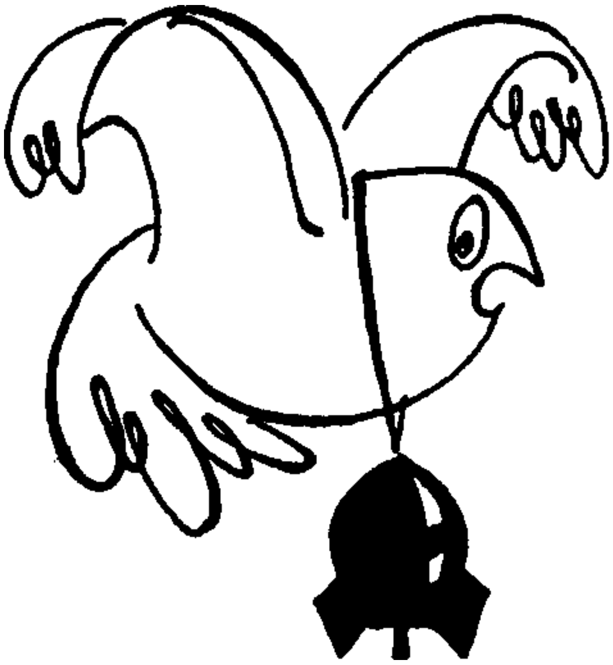
The explosion of a nuclear device would be immeasurably more serious than the blowing up of an ordinary ammunition dump. Indeed, thirty years after Hiroshima US nuclear weapon designers became conscious of the fact that in the event of fire or ordinary explosion, there is a fair chance that a nuclear weapon could undergo nuclear detonation even if it had not been readied for use. This could happen, for example, if a bomber or missile were to crash upon one's own territory. Subsequently there was a massive effort to make nuclear weapons safer, as well construct the exceedingly elaborate electronic and mechanical safety catches called Permissive Action Links (PALs).

One does not know whether Indian and Pakistani nuclear weapon makers have put in the enormous effort needed to "safe" their weapons and to what extent they have succeeded or failed. But, generally speaking, our national disposition is that of risk takers. The notion of fate plays an important role in our poetry, language, and daily behaviour. Therefore, for both India and Pakistan, safety has never been an over-riding concern in driving cars and buses, disposition of toxic wastes, construction of buildings, and so forth. Why should we assume that it would be any different when it comes to building bombs?

A nuclear Ojhri is not, therefore, impossible. When Indian or Pakistani nuclear weapon are assembled and deployed to operational units, the danger will rise in direct proportion to their numbers. If a nuclear explosion occurs for whatever reason, the natural assumption would be that the device belonged to the other side. Even if the device actually belonged to one's own side, a government, fearful of public reaction, may commit the ultimate folly of attempting a cover-up. The consequences of this could be various, including the probable initiation of cross-border nuclear hostilities.

No one knows how probable accidental Pakistan-India nuclear war is, no one knows what surprises Kashmir holds, and no mathematical equation can provide the answer we want. But let us recall General Zia-ul-Haq's famous remark, made soon after the crisis precipitated by India's Brasstacks exercises along the Pakistani border in 1986, "neither India nor Pakistan wanted to go to war but we could have easily gone to war." Therefore, to create a false sense of security in the post-nuclear age is an act of supreme folly.

(Dr Parvez Hoodbhoy is professor of physics at Quaid-e-Azam University. Islamabad}



The Rip Van Winkles at IAEA begin to wake up

At a recent conference, International Atomic Energy Agency's radiation safety director Abel Gonzalez said that the world must attack the growing hazard posed by lost, stolen, damaged, and misused radiation sources. "In half the member countries of the IAEA, there is virtually no systematic management of sources," Gonzalez said. "And in about 50 more countries which are not IAEA members, the situation is even worse."

The International Committee for Radiological Protection (ICRP), Gonzalez said, has issued 70 publications but only two on sources, and none concerned with the security of materials. ICRP guidelines, he said, are "simplistic," calling for the prevention of radiation releases from sources but offering no technical guidelines. The ICRP guidelines "are only motherhood-and-apple-pie statements," he summarized.

Observers at the conference said they expected a major IAEA redirection of efforts in less-developed countries by the Division of Technical Cooperation, where the IAEA has been pushing for nuclear development in industrial programs relying heavily on use of sources, toward safer practices in using radiation sources. One IAEA official said, "From now on, if the IAEA doesn't see a solid infrastructure in a country for making sure the sources arc used properly and kept track of, it won't be able to justify" programs in that country on food irradiation, medicine, and other ventures.

The Department of Atomic Energy, whose responsibility it is to ensure the safe handling of radioactive material, is not worried. But that is no surprise. Nothing worries them. They claim that India has a very fine record of safety regarding transport of radioactive materia). All reports one keeps hearing of regarding missing radioactive pencils, radioactive sources in the Cooum river and so on are just mere accidents. DAE is notorious for its secretive ways. Missing radioactive sources, unless they lead to some major tragedy are likely to be just filed and forgotten. Some years ago in Anumuku we had carried a bizarre story of a missing Techops camera with an iridium-192 source which had got misplaced in the Indian railways.

Not the only one

At the international meeting in Dijon. France, middle of September, it was apparent that India is not the only country where radioactive sources go missing in trains. Some so-called advanced countries are even more advanced in following hazardous practices.

In the U.S., nearly 200.000 people and institutions have been licensed to use radiation sources and the total number of sources in their hands is about 2 million. "We have no national inventory and we are not in touch with the licensees of these sources," said one U.S. official in Dijon. The result of bad management and neglect, Gonzalez said, is a "long and worrying scries of accidents all over the world, including numerous fatalities."

Since 1987, when the world was shocked by grave safety violations involving an abandoned therapy source in Goiania, Brazil, which killed four people and produced consequences which arc still inflicting local hardship, the IAEA has recorded six more fatal accidents involving unsafe handling of sources. These events killed eight people and seriously injured over a score of others.

One recent incident, in Estonia in 1994, is emblematic of the tragic problems which can occur if a source is lost and authorities fail to follow up. once it is recovered or found, said John Croft of Britain's National Radiological Protection Board.

In a scrap yard in Tallinn, a source was found by routine radiation measurement and transferred by the Estonian Rescue Board to a national waste disposal facility at Tammiku about 20 kilometers **away.** But on October 24, three unemployed brothers broke into the compound to find items they could sell to scrap dealers in Tallinn. They found a metal container with the source inside. One piece of the source fell out and was picked up by one of the brothers, who put it in his coat pocket. Soon thereafter he fell ill. and he died of severe radiation injuries to his leg and hip on November 2, 1994.

But the injury and death were not immediately traced to radiation exposure, and the remaining parts of the source were left in the house with three other family members. One. a stepson, was hospitalized on November 17 with what was recognized by doctors as severe radiation burns *on* the hands. Only then did the Estonian Rescue Board recover the material they had originally brought to the waste storage site back in October. But other family members were also diagnosed soon after with radiation bums. An analysis of the event by the Swedish Radiation Protection Institute suggested that the deadly item was a Russian-origin cesium- 137 source with a strength of about 100 Curies

As a result of this accident, Estonia began a program to organise its source inventory. By chance, one of the experts involved in that search had his detecting equipment switched on while driving on the road between Tallinn and Narva He found on the mad a second Cs- 137 source with activity of 50 Curies in another metal container. Estonia doesn't know *haw* many deadly sources are still at large.

Soviets Walked Away'

An unpublished accident investigation report on the Estonian case by the IAEA states, "There appears to be little information on the range of sources manufactured in the former USSR." German officials said that lack of Russian information is only part of their problem in source management

They reported in Dijon that Soviet sources, mostly abandoned in military camps when the Red army decamped in 1991-93, were involved in about 12% of cases involving sources in Germany.

The Soviet military "just packed their bags and walked away" from their huge compounds and barracks in the former East Germany, one German official said. In many cases, they tore down their buildings and left piles of rubble with dangerous sources underneath. Some sources are believed to have been plowed into the ground when the area was razed for development after western German investors took over. "We'll never know the consequences until the sources are found or their contents trickle up to the surface, or down into the water supply," one German expert said. Another fatal recent case involving a radiotherapy source, in Kutaisi, Georgia, in 1996 is also the legacy of Soviet military occupation.

During that summer, several frontier guards in a camp which had been set up as a training camp for a nuclear, logical, and chemical warfare programs of the Soviet Army developed radiation lesions. A search for the cause turned up 11 Cs-137 sources, each with an activity of about 4 Curies, plus four weaker sources, of a type used by Soviet Civil Defense specialists. Some of the sources were buried around the camp site, while others were found in coat pockets. One of the victims of radiation poisoning the sources is dead.

Need for an IAEA Register

Experts at Dijon said that failure of the U.S. to keep track of 1.5-million sources was typical of many large countries where sources abound and where, out of complacency, no effort has ever been made to develop a running inventory. One Russian official said that radiation protection authorities in his country had "absolutely no idea" how many sources might have been in use. "The number might be 100,000 or it might be 1-million;" he said.

Guenter Weimar from Germany's Federal Ministry of environment (BMU), told the conference that outcome of the meeting should be a resolution to register lost and found sources with the IAEA. Germany learned that lesson in 1997 and this year, when four Cs-137 sources were found in three scrap heaps. German investigators found that a source, unshielded on a scrap pile last year, had been manufactured by a French firm about 30 years earlier. "But we don't know anything about its history in between the time it was made and when we found it," Weimar said. An IAEA registry of sources known to be lost or found could expedite identification across national lines, he said.

Scrap yards and steel mills are threatened with contamination when their operations accidentally melt sources found in scrap raw materials, experts noted. They, too, would be aided in watching for sources if their governments are alerted by the IAEA that sources were recently lost or reported stolen near points where the firms had purchase scrap metal. Because it was unaware that a source had melted in its scrap, the Spanish stainless steel firm Acerinox lost valuable time in following up, generated huge volumes of waste, and suffered an economic loss of about S25-million earlier this year.

Based on a report by Mark Hibbs in Nucleonics Week.

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Rs. 30/- per year (6 issues) (only within India)

U.S. $ 15/ - per year or equivalent in other currencies for airmail overseas

Rs. 360 for life (only within India)

Demand drafts should be drawn on the State Bank of India, valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 107- collection charges

subscriptions, donations and enquiries regarding circulation should be addressed to:

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Sampoorna Kranti Vidyalaya
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Anumukti Team: Hansa, *Daksha*, kiran, *Prashant*, Philips, *Kalpesh*, *Sanghamitra and Surendra*

Published by S.Gadekar for Sampoorna kranti Vidyalaya and printed at Ashish Offset, Surat

Publication Date: December 31, 1998

PRINTED MATTER (Book Post)

ANUMUKIT

A Journal Devoted to Non-Nuclear India

Volume l2 Number 2 *October ! November 1998*

The Mirror Across The Border

Nuclear Circus Comes To Town

What is the May 28th nuclear circus for? One could take the government's word for it and accept that it is a celebration of "self reliance" of an "impregnable defence." Given that the government is in such denial about what is happening in the country and habitually lies even to itself, it is better to not take such answers seriously. The circus itself, however, has to be taken very seriously. It offers a glimpse into the future.

The nuclear circus is clearly meant as a prop in the narrow political sense. It is being put on as an opportunity to deepen and broaden support across the country for the government and for nuclear weapons. One need look no further than the planned celebrations which are said to include "a competition of ten best milli songs, seminars, fairs, festive public gatherings, candle processions, sports competitions, bicycle races, flag hoisting ceremonies etc. People will offer Namaz-e-Shukrana as well. Apart from this special programmes for children would be arranged. Debates would be held among school children."

To make sure that no one misses out on their quota of this new common-sense about the great and vital contribution made by nuclear weapons, and those who made them, to Pakistan there are to be appropriate programmes "broadcast on national network as well as locally by all 24 stations of the radio. In addition ot the national language Urdu, programmes in regional languages, including Punjabi. Sindhi. Pushto. Balochi, Brahvi. Saraiki. Potohari, Hindko, Balti and Shina will also be broadcast The external service and world service will air special programmes in 15 foreign languages for listeners in Europe, Middle East, Africa and South East Asia. The Azad Kashmir Radio will also broadcast special programmes on the occasion in Kashmiri, Gojri, Pahari and English languages."

This would be all harmless entertainment if it was not centred on nuclear weapons. But it is. There has probably never been an occasion like this before, where a state used all its resources to build into its very national identity a pride in its capacity to commit genocide. As Mushahid Hussain proudly put it "Chagai has become a symbol of Pakistan's identity all over the world " If it succeeds at its efforts at creating a nuclearised nationalism, Pakistan, henceforth, shall be a country whose identity is based not just like others on a sense of a shared place, or history, language, culture, or even religion. This identity shall centre on a technology, and that too a technology of mass destruction. Rather than simply being a nuclear weapon state, it may become the first truly nuclear nation

For this reason, the nuclear circus is fundamentally immoral. It is nothing less than a state sponsored celebration of mass murder. Weapons are tools of violence; and nuclear weapons the ultimate in such tools. All decent people detest them. No one should glory in their existence, never mind their possession.

The attempt to create a nuclear nationalism raises the question of how Pakistan will ever deal with nuclear disarmament. For the ringmasters of the nuclear circus, that day is obviously never to be allowed to dawn. Whenever the question of disarmament is raised, they will point to the public support for nuclear weapons (hey have worked so hard to manufacture and say: "How can we? Our people will not permit it. They want nuclear weapons." With this they arc trying to close permanently the door to real peace. Far better in their view a hate-tilled nuclear-armed confrontation with India that in turn gives cause for demands for high military spending, and excuses state failure and government excesses in every other area.

The nuclear circus *is* also obviously meant as a national distraction. It shall be a brief respite from the daily experience of failure that consumes the time and energy and resources of the people of this country. There is hardly any point in recounting either the specific failures or the crises that have created them. It *is* all so well known. But it *is* worth doing as an act of solidarity with Najam Sethi, the editor of The Friday Times, who absolutely correctly observed in his speech in India on April 30th that "Pakistan's socio-political environment is in the throes of a severe multi-dimensional crisis. I refer to six major crises which confront Pakistan on the eve of the new millenium: (1) the crisis of identity and ideology; (2) the crisis of law, constitution and political system; (3) the crisis of economy; (4) the crisis of foreign policy; (5) the crisis of civil society; and (6) the crisis of national security."

It is these fundamental political and social crises that the glitter of the nuclear circus and the rocket's red glare is meant to conceal. The success of May 28th is meant in one single act to overcome fifty years of abject failure to do anything but fail. This is why May 28th is now declared to be the most important date since independence. It is meant to mark a new beginning, the rebirth of a nation.

This third birth of Pakistan, after 1947 and 1971, is however no more auspicious than the first two. Each birth has been violent and produced violence. The first, out of the horrors of partition, failed to produce a viable constitution and led to military dictatorship and twice to war. The second birth, out of the slaughter in Bangladesh, failed to produce democracy and led to more dictatorship, and the sectarian demons who now haunt the land. This third life, born out of nuclear explosions, carries the threat of terminal violence.

It is worth delving a little deeper into what the nuclear circus is meant to conceal. It is meant to be an affirmation of strength, "virility," and pride (at least that is what President Tarar called it). What this tries to conceal, if not erase, is that events after the May tests provided clear evidence of how weak this country actually is. The sanctions that were imposed by the international community after the tests were lifted not because the world was awed by Pakistan's new nuclear might, but because for once they took a really good look at it and were horrified by its obvious weaknesses. Sanctions were lifted because otherwise the country would have fallen apart and nobody wanted to see that happen. It was an act aimed to protect Pakistan from itself- or more accurately, to try to protect its people from the criminal stupidity and recklessness of its leaders.

It is easy to see how having to accept this realisation of weakness would have created a crisis among those who were responsible for taking the decision to test. On the one hand they tested nuclear weapons and thought of themselves as being strong and having broken the "begging bowl." On the other, the world offered them pity and charity, because otherwise the country would collapse. And thus the nuclear circus as a way of ridding these fears and memories from their minds, of burying them forever. The louder and brighter and more strident the circus, the deeper the anxiety about being weak shall be pushed and more determined the attempts to deny it.

Given how personal politics has always been here, there is no avoiding the fact that the nuclear circus is also a form of self-gratification - a way for Pakistan's current crop of leaders to make themselves feel better about themselves. They know, at one level, that the rest of the world looks on them as not just venal and corrupt, but pathetic and pitiful figures ruling a country struggling to keep its head above water and who have to be protected from the consequences of their own actions. During the circus though, the nation will unite "to pay tribute to the courage, statesmanship and maturity of Prime Minister Nawaz Sharif' as one government press release put it. The government will make sure of it.

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■ From The

A Long Way To Go

A march for global peace was begun on the first anniversary of the bomb blasts at Khetolai near Pokran. It will go up to Sarnath near Varanasi reaching there on 6th of August to coincide with the anniversary of the first use of such bombs on people. The marchers shouted "Our slogan is world peace, the future belongs to us; and "Victory to life". Yet in Ramdeora near Pokran, some fifteen young men threw stones at the marchers causing a grievous head injury. Perhaps these enthusiasts want victory to death. But why pick on these few bajarangis. The ruling party launched its election campaign the same day, hoping to remind the people of its great achievement. In an insane society, the sane who need justification.

Even friends, people who clearly say, "We need to reject nuclearisation because of its social cost, new patriarchies, danger of state authoritarianism, damage to the environment, erosion of citizens' rights from a standpoint of democratic and ethical principles" make a distinction between nuclear energy and nuclear weapons. They fail to see the simple fact that nuclear energy and nuclear weapons are one and indivisible. One cannot logically oppose one and support the other. The best example of this is provided by the deal with Russia to buy two VVER reactors, presumably because Indian-scientists are so busy making the bomb that they cannot be expected to fulfil their targets for nuclear energy as well. There is also the matter of the nuclear powered submarine, a highly expensive submersible tub needed to hide those grand weapons from the enemy so as to keep the minimal nuclear deterrent, credible. Indian 'scientists' who seem to be so good at making nuclear firecrackers and long range missiles with exotic names have been miserable failures in designing a nuclear powered submarine. As a result, we have no choice but to accept whatever junk the Russians offer not only for the submarine but also for the nuclear power plant. Yet people with blinkers take a benign view of atoms for peace! We have a long way to go.

Pokran Revisited

Ground Zero & Zero Tolerance State

From Jodhpur the road shoots straight as an arrow across the desert to Jaisalmer, 300 km away; almost exactly halfway is Pokran. The giant hammer of the sun crashes down with soundless fury on the flat anvil of the scrub-covered plain. An occasional deer bounds over the thorn bushes, lured by the mirage of water shimmering in the distance. A year after Shakti the illusion is particularly apt.

Pokran II was the most re- sounding statement about the power of the Indian state to be made in decades. Its reverberations have been international: pro or anti, everyone now had to take the Indian state seriously. But how serious is that state about taking it- self seriously? How strong are its powers of intervention? And how uniform or selective is their manifestation? After the blast, what is the ground zero reality of Pokran today?

A 20-minute drive from Pokran is Khetolai, the village nearest to ground zero. Ground zero itself is completely out of bounds for civilians Khetolai, now famous for its cracked houses and cancer patients, is home to the Bishnois, the first conservationist community in the world. Their religious beliefs forbid them from felling trees and killing animals and some have even died while trying to protect the environment. It is a grim irony that they should have been chosen to bear the cross of Shakti.

Skeptical Villaege

A dusty road through the scrub leads to the house of Rajkumar Bishnoi, a school teacher in the village where a Sunday morning meeting is on. The villagers are skeptical of being heard where it really matters, having bared their collective soul to a voyeuristic media on many occasions over the past year. "You are from Delhi, tell us does anybody really care about us?' asks Sukhram, a young man.

Khetolai knows the answer. Il has never waited for the state to deliver. It has quietly usurped the state's role, much like a copybook cooperative society. Education is a religion here. The village is fully literate barring those some who have married into it. The student- teacher ratio is ten to one.

Recently, (Sohanram Bishnoi. the secondary school headmaster, has devised a novel way of encouraging women to join the literacy drive. He has put up a blackboard near the water tank where they come daily with a new lesson written on it each day. Water is a major problem. Kane han. Radha and Bhagwati say that 20 to 25 trips a day to the tank is normal. Until last year, the only source of water was a pipeline from Lathi, 25 km away. The villagers collected Rs 70,000 and built a tank themselves

Bleeding Cows

The water quality is appallingly poor. In the past year, the villagers have had to drink water that could well be radioactive. Rajkumar, a villager, says some JNU researchers came earlier with counters to measure radioactivity, but have not been heard about since then. But since the blasts, several people have been complaining of smarting eyes, bleeding noses, kidney and heart ailments and skin diseases

Cows in the village have been seriously affected by the Masts. Their udders are blocked and frequently bleed and some have gone blind. Repeated requests to the authorities to investigate the fall- out of the nuclear tests have been ignored."This is a gross violation of human rights, don't we have a right to know if we are at risk? asks Rajkumar. The village has only a dilapidated dispensary with no medicines or doctor.

Khetolai is a microcosm for the India that the state has shut itself from. A world away from Khetolar is Tilak Marg in the bean of Delhi, one of the selected thoroughfares in the capital to be officially designated as a Zero tolerance zone': Even the most minor traffic infringement on this stretch will be stringently and immediately punished. Yet Delhi has the macabre distinction of being the road-death capital of the world; there are more traffic fatalities every year in Delhi than in any other city With a few notable exceptions such as the so-called BMW incident' earlier this year when four people were mowed down by a speeding auto- mobile, by and large, these killers on wheels gel away scot-free. 'Zero tolerance' succinctly sums up the selective nature of the state: within certain narrowly defined parameters social, economic and political — it displays zero tolerance of even the smallest technical transgression. And as if to make up for this blinkered severity in most other areas it scores zero in registering and responding to the legitimate rights of its citizens. Hollowing the shoot ing of a young woman in a crowded Delhi restaurant where alcoholic drinks were illegally being served, state authorities have shown zero tolerance of the unlicensed sale and consumption of liquor; officialdom has also demonstrated near zero performance in controlling the proliferation of firearms and other lethal weapons in the capital and elsewhere in the totally un monitored reaches of the country. In the name of national security, the state has zero tolerance of anyone taking a photograph of even civilian airport facilities anywhere in the country; yet gun-runners can with impunity evade an Indian Navy blockade, allegedly with the connivance of top-level elements of the zero performance state. The zero tolerance state frowns at enduring illiteracy; the zero performance state permits the proliferation of schools which have no blackboards, no text- books, no teachers, and often no students but are deemed to be schools nonetheless.

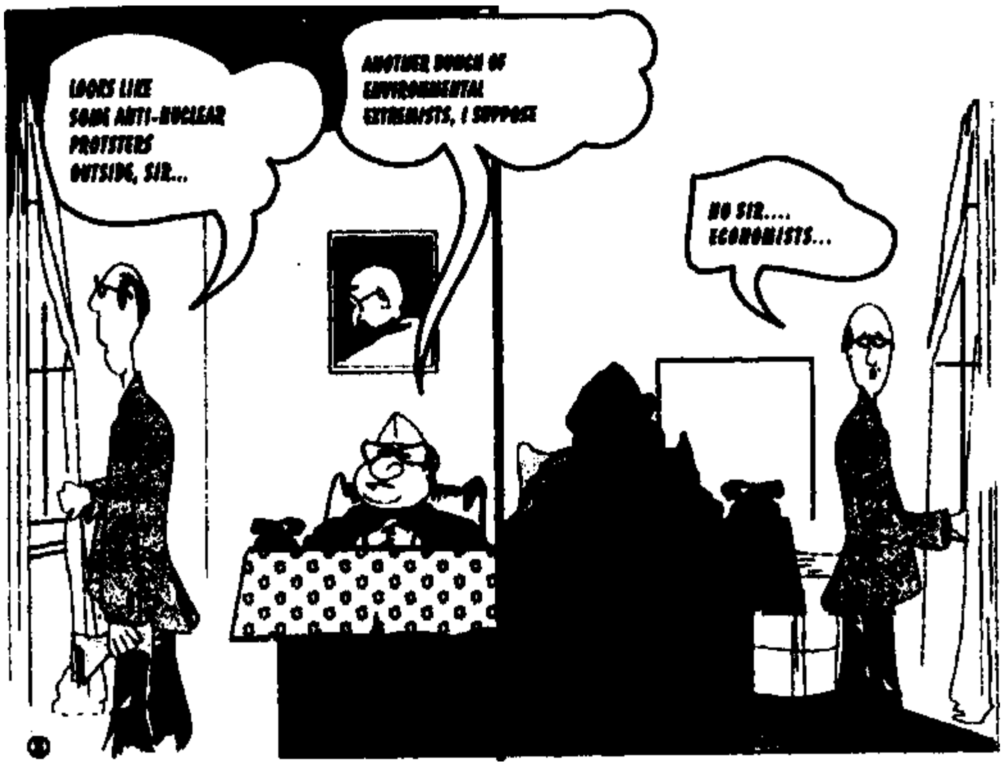
Market Fills Vacuum

The Indian state as it exists today is like the oppressively absent presence of the 'man on the stair' in the anonymous doggerel.

> *"Yesterday upon the stair*
> *I met a man who wasn't there*
> *He wasn't there again today,*
> *I wish to God he'd go away."*

Last week when the hills of Garhwal were a blazing inferno, a correspondent for this newspaper who was covering the catastrophe tried to find a public call office to telephone her report in to Delhi. She was unable to find a single PCO in that area; telecommunications as an instrument of the zero tolerance-zero performance state simply do not exist in that part of the country. But the ground in the remote forest was littered with plastic bags; a tiny shop in a village without electricity stocked bottles of Pepsi and Mirinda. The zero control state had yet to reach the village; but in the vacuum, the market had set up shop.

Jug Suraiya
Sanghamitra Chakraborty
Times of India llth May 1999


LOOKS LIKE SOME ANTI-NUCLEAR PROTSTERS OUTSIDE, SIR...
ANOTHER BUNCH OF ENVIRONMENTAL EXTREMISTS, I SUPPOSE
NO SIR.... ECONOMISTS...

Study Finds Radioactive Particles May Be More Damaging than Expected

Cells may be more sensitive to genetic damage caused by radiation from radon gas than previously believed, according to research that found high energy particles do not need to hit the nucleus of a cell to cause DNA changes.

In a laboratory study, researchers aimed alpha particles — a decay product from radon gas — at the fluid surrounding nuclei in cells taken from a hamster, and they found that radiation could cause genetic changes.
'The prevailing view has been that in order to cause genetic damage you have to irradiate the DNA directly in the cell nucleus," said Gerhard Randers-Pehrson of Columbia University, a co-author of the study in the Proceedings of the National Academy of Sciences. "What we find is that you can irradiate outside of the nucleus and still cause that type of damage."

Radon gas can leak from the earth and collect in basements. When inhaled, the gas can leave in the lungs alpha particles that emit low levels of radiation over long periods of time. Just how much radon poses a health risk has been controversial, but the Environmental Protectection Agency recommends that the concentration of radon gas in homes be kept below 4 picocuries (a measure of radiation) per liter of air. Radon cancer risk estimates have been based, in part, on the belief that mutations that can lead to cancer occur only if radiation particles directly hit the cell nucleus that contains the DNA.

In the new study, Randers-Pehrson and his colleagues used a machine to zap cytoplasm, the part of the cell outside of the nucleus, with precise numbers of alpha particles. The number of particles is representative of the intensity of radiation exposure. They found that cytoplasm hits of three to eight particles could trigger a genetic change in a cell. Randers-Pehrson said they also found that when the cytoplasm was hit, the cells tended to survive and were more likely to pass mutations into new generations of cells, a critical step in the formation of cancer. Alpha particles striking the DNA directly tends to cause such extensive damage that the cell is generally killed and does not make hew cells, he said.

Source: Associated Press 26.4,' 99

Nuclear Power's Bright Future is Already Past

Two decades after the world's first major nuclear accident at Three Mile Island, the nuclear industry is experiencing a meltdown of historic proportions. After growing more than 700 percent in the 1970s, and 140 percent in the 1980s, nuclear generating capacity has increased less than 5 percent during the 1990s so far. In the last decade, nuclear power has gone from being the world's fastest growing energy source to its slowest, trailing well behind oil and even coal. In 1998, world nuclear generating capacity fell by 175 megawatts.

At the 20th anniversary of the Three Mile Island accident on March 28, global nuclear capacity stands at 343,086 megawatts, providing just under 17 percent of the world's electricity. Both of these figures will likely turn out to be close to the all-time historical peak-and less than one-tenth the 4,500,000 megawatts that the International Atomic Energy Agency predicted back in 1974. The WorldWatch Institute projects that global nuclear capacity will begin a sustained decline by 2002 at the latest, and the U.S. Department of Energy projects that it will fall by half in the next two decades.

Nuclear power's biggest problems are economic: it is simply no longer competitive with other, newer forms of power generation. The final 20 U.S. reactors cost $3 to $4 billion to build, or some $3,000 to $4,000 per kilowatt of capacity. By contrast, new gas-fired combined cycle plants using the latest jet engine technology cost $400-$600 per kilowatt, and wind turbines are being installed at less than $ 1,000 per kilowatt.

Even France, which gets more than three-quarters of its electricity from nuclear power, now has a moratorium on nuclear plant construction, and other European countries are debating how quickly to shut their plants down. The only countries still building nuclear power plants ait nations such as China, Japan, and possibly Inn, where the electric power industry is still a government sanctioned monopoly that is protected from compaction.

By the end of 1998.429 nuclear reactors were operating worldwide, one less than five years earlier. Construction is taking place at 33 new reactors. Of these, seven are likely to be completed by the year 2001, while another fourteen may never be completed. Although global capacity is likely to rise for another year or two, it will almost certainly decline precipitously in the following years as the construction pipeline dries up. and the closure of older, uneconomic, or unsafe reactors accelerates.

In the aftermath of the 1979 Three Mile Island accident, the U.S. nuclear market was the first to deteriorate. No new nuclear plants have been ordered since then, and where nuclear generating capacity is now lower than it was a decade ago. Not only have U.S. power companies stopped building nuclear power plants, they have closed six reactors since 1996 that had become too expensive to operate. Meanwhile, seven of Canada's 21 reactors have been 'laid up" due to safety concerns and are unlikely to operate again.

For North American nuclear power, though, the worst may be yet to come. Wall Street analysts and the Washington International Energy Group project that as many as one-third of US and Canadian reactors arc vulnerable to shut down in the next five years. The main reason is cost: nuclear energy cannot compete in increasingly competitive power markets.

Western Europe stayed with its nuclear expansion plans longer than the U.S. did, but since the 1986 explosion at Chernobyl sent a cloud of radioactive dust across Europe, the public has turned against nuclear power. Since then, construction has started on only three new reactors. France, long known as the most pro-nuclear country, now has a moratorium on nuclear plant construction, and the Environment Minister, Dominique Voynet, has called for making the ban permanent. A December 1998 poll found that only 7 percent of French citizens thought that nuclear power should be the top energy priority, compared to more than 60 percent who said the priority is renewable energy. The state owned unl ity, Electrieite de France, which has in the past put virtually all its efforts into nuclear power, has begun to invest in "pintsize" microturbines, and in the development of wind power, both in France and in Morocco.

In Germany, the discussion is not over whether to build more nuclear plants, but on how quickly to shut down the existing reactors. While the previous German government shut down al) the nuclear power plants in eastern Germany, the *Social* Democrat/Green government elected in October 1998 plans to phase out the 19 remaining reactors that produce 30 percent of the country's power. As of February 1999. the Government had agreed that the first reactor will be closed by 2002. though the country's electric utilities arc still fighting the plan.

Asia remains the last stronghold tor the nuclear power industry, with 88 reactors operating and 26 under construction, though even there, a slowdown is evident. Japan, which obtains 35 percent of its electricity from the atom, only has two reactors under construction, with work starting on one of them in 1998. In fact, the plant at Higashidori in Aomon was the first new one approved in ten years. Glutens groups have nearly stopped construction of new plants, and some communities have passed referenda prohibiting additional units. Although the government plans to add some 20 new reactors by 2010. officials acknowledge privately that the plans are unrealistic, South Korea, meanwhile, has six additional plants still under construction, but there too. the nuclear industry faces grow ing public opposition.

Nuclear power plants are dangerous. They are also extremely dirty. But what has killed nuclear power all over the world is the fact that the electricity produced by it is just too expensive and cannot compete in the market-place. It is only bureaucrats wasting public funds who continue to order new nuclear power plants.

China has the world's most ambitious nuclear program today, with plans to go from the three reactors it operates now to more than 50 reactors by the year 2020. The country currently has six reactors under construction, with plans to add four more. Whether the Chinese government will achieve these ambitious aims is uncertain, given the high foreign exchange requirements of imported reactors and the lack of a sizable indigenous industry. Moreover, China is likely to face growing pressure to make its power industry more competitive, which would likely complicate nuclear development efforts. Efforts to develop nuclear industries in Indonesia, Thailand, and Vietnam have all been abandoned in the last few years.

Around the world, it is nuclear power's high cost that has most damaged its market prospects. Most nuclear power plants have been built by monopoly utilities, and the costs were passed through to consumers, regardless of how high they were. But with governments around the world now opening electric power markets to the winds of competition for the first time, nuclear power must stand on its own. This development is the final blow to the nuclear industry. It is only in the few remaining protected power markets-mainly in the Par East-that any additional plants are being ordered.

One indication of nuclear power's economic status is the price it has been commanding on the open market. The Pilgrim plant in Massachusetts was sold for $80 million, though $67 million of that was for fuel. Also last year, CBS decided to sell what was once the world's largest nuclear company, Westinghouse Nuclear. The company sold for just $ 1.2 billion. By contrast, Exxon is valued at $172 billion, and Microsoft at $278 billion.

Orders for new reactors have largely dried up. The few remaining nuclear companies, including France's Framatome and Germany's Siemens, are surviving on maintenance work, and government-sponsored contracts to refurbish Eastern Europe's decrepit reactors. If new business does not turn up soon, there may be little nuclear construction capacity left. In light of the long lead times in nuclear construction, the decline of nuclear power in the early decades of the new century has become virtually inevitable. The U.S. Department of Energy, successor-agency to the U.S. Atomic Energy Commission, now projects a sharp decline in nuclear power generation in the next two decades.

Nuclear industry supporters argue that given recently heightened concern about fossil fuel-induced climate change, the timing is tragically ironic. Existing nuclear plants do displace the emission of large quantities of greenhouse gases from coal-fired plants, but few governments are seriously considering nuclear power as an alternative to fossil fuels.

Instead, they have responded to climate change by investing in new energy technologies such as solar energy and wind power. As a result, renewable energy sources are now expanding rapidly. Last year, while nuclear capacity fell, wind power capacity rose by 2,100 megawatts. These provide tiny amounts of power today, but arc already growing at the kind of double-digit rates that nuclear power enjoyed in the 1970s. And the new technologies are not threatened by the kind of physical or economic meltdowns that have done in the nuclear power industry.

Christopher Flavin & Nicolas Lenssen
Source: Worldwatch website at
(www.worldwatch.org)

Fighting the Powers in Koodankulam

S. P *Udayakumar*

There seems to be an uneasy lull in Koodaitkulam. Newcomers attract immediate attention at the Village Square. And talking about the impending nuclear power project pulls a real crowd. There is an ardent fervour in the crowd to pour out their hearts, and an intense anxiety to know about their future.

Most people who engage in conversation are still bitter about the Indian government's land acquisition process for the nuclear power project. They complain that an inadequate amount of Rs. 2,000 was given per acre and a meagre additional amount of Rs. 100 was paid for each cashew tree on the land. Many of these people had tamarind trees on their lands that used to fetch them approximately Rs. 2.000 every year. The lands were taken in the 1980's. and for many people these lands were the only assets their families had.

Many residents of Koodankulam acknowledge that they did not know what the nuclear power project was all about and had very little knowledge about radiation hazards. Some were sincerely hopeful of swapping lands for jobs in the lucrative central government sector. Now they are slowly waking up to the reality that not only the jobs and better life are elusive but they could also be evicted out of the area. Most of them are justifiably concerned about the risks and dangers involved in the nuclear power plants.

There are, of course, people in Koodankulam who support the nuclear power project and are very enthusiastic about it Interestingly enough, many of them have an eye on winning a contract to provide manual labourers and supplies for the construction of the plants and buildings or to undertake portions of the construction itself. The tension between these ambitious entrepreneurs and the anxious landless is very much visible.

Then there is a third group that boasts sanctimoniously with an "l-told-you-so" rhetoric. They claim that they had warned their fellow villagers to be careful about selling their land to the government They say they knew that nothing good would come to them out of the whole project. And now it is too late to do anything.

As a result of all these divisions and confusions, civic courage gives way to superstitious beliefs and resignation. These 'believers' point out that Rajiv Gandhi, who signed the deal with the Soviet Union to establish the project was killed later and that Deve Gowda, who revived the project lost power immediately thereafter. These arc enough indications for them that the nuclear project will never come up in Koodankulam.

Unlike the confused and the contended, there are some individuals and small groups in Koodankulam that engage in active opposition to the nuclear power project. Mr. Thangathurai Swami, who manages his family's anoestral Narayanaswami temple on his family land that lies inside the Koodankulam project compound, steadfastly refuses to sell his land to the government. As he puts it, "1 cannot sell my God and the temple." Devotees from Koodankulam and all the neighbouring villages do come and attend the traditional Sunday worships.

Another Mr. Muthukumaraswamy, a retired schoolteacher from Koodankulam, *it* also resisting the government's usurpation of his land by filing a suit in the Tirunetveli district courts. Besides pointing out the problems due to the inadequate monetary compensation paid by the goveminent for the lands, Mr. Muthukumaraswamilabo cites the Government Orders that farming land and burial grounds should not be taken for this kind of large industrial initiatives.

There is also a dormant group called • 'Nuclear Power Opposition Group' in Koodankulam but the major activity is just publishing some occasional handbills. The tea-stall discussions and village square debates often do not amount to much

If Koodankulam is this indecisive, the surrounding villages and towns are not doing any better. There is a plethora of social service organisations in neighbouring villages such as Thisayanvilai. Meignanapuram. Nangunen. and other places in Kanyakumari, Tirunelveli. Thoothukudi and Madurai districts.

In Kanyakuman district for instance, the Social Action Movement (SAM), an umbrella organisation comprising of some social work agencies, carries out some awareness raising campaigns on the Koodankulam issue. Just like Mr. D. Mathias of SAM. Rev. Y. David of the Samathuva Samuthaya lyakkam (SSI), loosely translated as Social Equality Movement, has also been educating the public about the dangers of nuclear power projects since 1988. Quite a few organisations that concentrate on an assortment of social is sues also discuss the Koodankulam project The Palmyrah Workers' Development Society (PWDS) of Dr Samuel Amirtham. the Peace Association for Social Action (PASA) of Dr. Gnana Robinson and other such organisations take interest in the nuclear power project issue.

An important actor in the anti-Koodankulam mobilisation is the National Alliance of Peoples' Movements (NAPM). that works in close association with many farmers' unions, fishworkers' groups, and the local chapters of the National Fishworkers Forum (NFF), and the Tamil Nadu Fishworkers Union (TNFU). The NAPM conducts periodic seminars and occasional workshops on various issues including the nuclear project. Recently the NAPM organised workshops in Madurai, Tirunelveli and Nagercoil on the safety aspects of the VVER light-water reactors that are going to be installed in Koodankulam.

Although fears of radioactive contamination figure prominently in many of these groups' campaigns and pamphlets, environmental dangers, health risks, nuclear waste disposal issues are also often raised. The impending diversion of Pechipparai dam water for the Koodankulam nuclear power project is also causing grave concern among the farmers of Kanyakumari district and adjacent areas.

Another popular issue that political parties often resort to is providing job opportunities for the people of Koodankulam. On February 9, 1999, the local Tamil Manila Congress MLA, Mr. Appavu, headed a dharna in Koodankulam with the singular demand of giving job opportunities to the people of his constituency that includes Koodankulam and other nearby villages.

One can also encounter handbills and pamphlets put out by many nameless and faceless groups such as 'All College Students' Federation,' and 'Koodankulam Nuclear Reactor Opposition Group' etc. Although the English press publish articles by prominent writers and thinkers such as Buddhi Kota Subbarao, S. Ambirajan. Prema Nandakumar, G. Balamohanan Thampi, Dhirendra Sharma,T. Shivaji Rao, and Iravatham Mahadevan arguing persuasively against the Koodankulam project, the local Tamil newspapers are strangely indifferent.

Despite the fact that all these social, political and intellectual entities are sounding alarms, they are relatively dispersed and dissimilar. The various social movements have not made many inroads in educating the public, or making a dent in the policymaking processes. The ideological and organisational discordance among some of these groups and leaders, financial issues, the insistence on one's own group getting the limelight are some of the handicaps they seem to have. There are also groups that do not want to jeopardise their government funding by being too much proactive on the Koodankulam issue.

Some of the anti-Koodankulam movements adopt a narrow 'not-in-my-backyard' approach. They just do not want a nuclear power project in their vicinity and do not care what happens next or where it is moved. However, some other groups take a principled stand and adopt a broader approach on the issue by stretching their interest to other nuclear power projects such as Kalpakkam near Chennai. They highlight the disastrous effects of the Kalpakkam reactors on the neighbouring coastal areas and the fishworkers' livelihood in those villages, and demand either closure of the plants or specific modifications.

Some of the nuclear power project denunciations betray anti-urban and anti-elite sentiments also. One such argument proposes that nuclear power projects should be built in or around the national and state capitals because that is where the elite lives and work. The proponents of this plan wonder why the Nuclear Power Corporation (NPC) office is situated in Nagercoil instead of Koodankulam itself. They question why the Prime Minister visited Pokhran not on the same day of the nuclear tests but almost after a month. The implied contention is, of course, that the elite knows how to take care of themselves and safeguard their interests by being away and insulated from these potentially dangerous projects. It is the poor who bear the brunt of all these projects and pay the heavy price.

Many people in and around Koodankulam think that the government will go ahead and establish the nuclear power project in Koodankulam and will eventually close it down if and when there is an accident. Dr. S. Thasan, a retired Tamil Professor of Marthandam Christian College, reasons that it is the general trend of our times that people ignore advice and warnings but feel sorry and make amends when disasters strike.

The Indian government is turning a deaf ear to local concerns and protests, and pressing ahead with the project. Dr. Rama Rao, Chairman of the Atomic Energy Regulatory Board, claimed in November 1998 that the site evaluation for Koodankulam had been done (The Hindu, November 6, 1998). A former member of the 'safety committee' constituted by the Central Government for the Koodankulam project claimed in April 1997 that the environmental issues had already been studied (The Hindu, April 7,1997). Intriguingly enough, government officials rarely mention this environmental impact study on the project, and individual efforts to get a copy of this study from New Delhi authorities have proved to be futile.

In the meantime, the Indian nuclear establishment has been organising workshops and seminars to mobilise the public-opinion in favour of the Koodankulam project. A two-day workshop in July 1998 on "Atoms in the Service of Mankind" sought to educate school teachers about the various aspects of the country's nuclear program and other current issues such as CTBT and NPT (The Hindu, July 25, 1998).

In a November 1998 seminar attended by the representatives of the Russian and Indian nuclear departments and academics, the Indian nuclear authorities revealed the entire structural and safety details of the VVER reactors. At the Indo-Russian seminar, Mr. Bulat Nigmatullin, Deputy Nuclear Energy Minister of Russia, said: "It [the seminar] is intended to inform the Indian public at large, mass-media bodies, independent experts and other possible seminar participants about Russian know-how and our many-year-old positive experience of operating and maintaining NPPs in the fullest possible and most objective manner. We also plan to inform them about other aspects of building, operating and maintaining nuclear power facilities in Russia and other countries, linking this with the projected Koodankulam NPP" *(The Hindu, November 6, 1998).*

Furthermore, the Department of Atomic Energy has established a Homi Bhabha Chair for Nuclear Science and Rural Society at the M. S. Swaminathan Research Foundation (MSSRF). Chennai, with the primary objective of disseminating information and mobilising peaceful usage of nuclear energy for the benefit of communities living in the regions adjoining the nuclear power plants (The Hindu. December 11, 1998). If anyone from Koodankulam or surrounding villages were invited to any of these rather technical events could not be independently verified.

The lack of coherence and focus among the various movements on Koodankulam is painfully obvious when we consider the fact that some of these latest developments are not widely discussed. Another pertinent issue that has been overlooked by the Koodankulam movements is the handling of the spent fuel.

According to Dr. Y. S. R. Prasad, Chairman of the Nuclear Power Corporation, the fuel for Koodankulam reactors would be supplied by Russia, but the spent fuel would not be sent back. It may be reprocessed to extract Plutonium, a key fuel for the fast-breeder projects that will be established in India in the future. When asked if a reprocessing plant would be set up at Koodankulam, Dr. Prasad said that it was too early to think about that (The Hindu, November 5,1998). There is hardly any debate on the implications of this ambiguity, the additional dangers of this reprocessing plant, the added risks the local people face and so forth. No one is questioning if the local people do not have a say in this issue.

Most importantly, the various Koodankulam movements hardly debate the alternatives to nuclear power in the larger framework of national development It is quite ironic that numerous windmills that produce electricity quite profitably surround the proposed site in Koodankulam for nuclear power project The viability and rewards of such renewable energy systems are also not highlighted by the protest movements.

Continued on page 13

Russia, rolling in money, offers $2.6 Billion loan for Koodankulam

The Russian government has offered a soft loan of $2.6 billion for the abstraction of the Koodankulam nuclear power plant in Tamil Nadu, according to a report here. Russia's state-owned Vneshekonombank has sent a message to the Indian government proposing the loan to supply the two 1.000 M W light water reactors for construction of the power plant. Itar-Tass reported.

Russia's economic crisis notwithstanding, the credit has finally been ottered for the implementation of the nuclear project that for many years was the centre of a controversy involving the U.S.. Russia and India. Russia made up its mind to go ahead in keeping its commitment to the Indian government in spite of American opposition Moscow and New Delhi signed a new supplement to their agreement of 1988. during the Soviet era. working out the payment terms.

The credit offer sets the stage for the execution of the project, which is being handled primarily by Atomstroieksport, the organisation that fulfils Russia's commitments in building nuclear power plants abroad, and the Indian nuclear energy establishment. The project involves more than 200 Russian organisations and enterprises.

"Russia will issue to India a credit for construction of the nuclear power plant at Koodankulam in hard currency and only ten per cent of the total costs of the construe non work will be financed through rupees generated out of Indian debts to the former Soviet Union." Itar-Tass reported, quoting Russian Ambassador to India Albert Chernyshev.

Russian specialists would mount the main assemblies in the primary circuits of the reactor and monitor the installation of the power-generating units at the plant According to the terms of the agreement, the Indian specialists would undergo advanced training in Russia. All the building operations of the plant, whose commissioning is expected to take six to seven years, would be monuored by the Vienna-based International Atomic Energy Agency (IAEA).

India *Abroad News Service*

Impoverished Russia willing to sell land to raise funds to pay back wages of nuclear employees

US company Non-Proliferation Trust Inc is necking approval to take tide to at 'least 6000 tonnes of spent fuel from countries such as Taiwan. South Korea and Switzerland and ship it to Russia for storage for at least 40 years. The proceeds of the venture expected to be at least US$4 billion - would go towards the disposal of 501 of excess Russian warhead plutonium, cleaning up contaminated nuclear sites in Russia, paying back wages of Minatom employees, and helping Russian pensioners and orphans. The company had originally proposed a cradle-to-grave fuel leasing scheme with storage at Wake Island in the Pacific Ocean.

Uranium Institute News Summary

WININ PEREIRA 1928-1999

Winin Pereira, died on February 5th. He had lived in Bandra. Here he was able to trace his Catholic heritage for the last three hundred years. Until the previous generation, the family had spoken Portuguese, even though Bombay had been 'given' to Britain as part of the dowry of Catherine of Braganza in 1661. Winin Pereira's father was a social reformer and committed to India's Freedom Movement.

Winin Pereira trained as an atomic physicist, and worked at the Tata Institute of Fundamental Research and with Homi Bhabha at the Atomic Energy Establishment. Increasingly perturbed by the danger posed by India's uncritical assimilation of Western science and technology, he resigned. This was regarded by the Indian establishment as a betrayal, and he was never to be officially employed again. He turned to development projects in Maharashtra, associated with a number of agencies; but soon became aware of the negative consequences of the received wisdom, including the promotion of chemical fertilisers and pesticides, cross-bred cattle and hybrid seeds. In consequence, he turned away from the conventional developmental path, and spent more and more time in an Adivasi rea. He had a small farm in Alonde, where he was happiest, learning from those who had lived symbolically with the forests for millennia without disturbing the ecological balance of the land, of which they regarded their own lives as an extension and an expression.

He began to collect examples of truly sustainable agriculture; and amassed a formidable reserve of knowledge of how things had been done, and how these continued to reverberate in popular memory. Having inherited his father's distaste for colonialism, he was acutely aware of the continuities between the British Raj and the Raj of the IMF/World Bank/transnational which have now replaced it. This, he felt, was made explicit after the Indian government formally embraced the liberalisation programme of 1991. He got out of the projects he was engaged on, and at his home in Bandra, set up the Centre for Holistic Studies. This was devoted to an analysis of the impact of SOO years of colonialism, and to the recovery of alternative, indigenous social and economic values. He turned to traditional Indian culture, respect for all things, living and non-living, the doctrine of ahimsa and minimal interference in nature. The Centre became a resource-centre and library with extensive databases. It offered support, information and encouragement to peoples' movements fighting unjust development, most recently, to those farmers resisting the Dabhol power project in Maharashtra. I met Winin in the mid-eighties: it was, for him a lean time. India was more and more committed to industrialism, consumerism seemed to have seized the imagination of the growing middle class, and few people were interested in recuperating what at that time appeared to be decaying traditions of frugality, self-reliance and the kind of modest security which the Adivasis had practised, and Gandhi had advocated. At that time, he felt isolated and disillusioned.

The first time I met him he sat opposite me, as the sunlight, reflected from the Arabian Sea, played in the room, kept cool by the creepers and fish-tail palms that had been planted around the plain house in Carter Road. I immediately recognised someone with whose sensibility and heart there was the kind of sympathy that requires no explanations • those rare encounters of the spirit that give new meaning and hope to our lives.

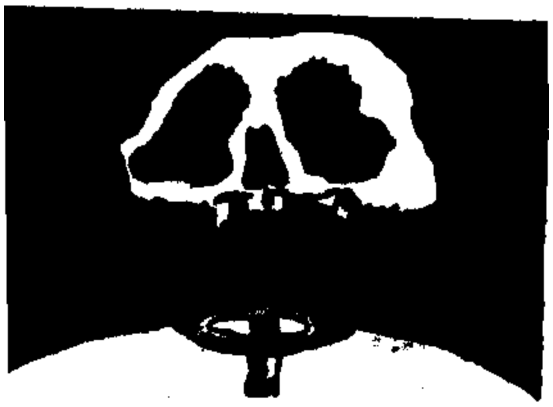
He invited me to stay with him and his family; and without hesitation I accepted. It was a kind of homecoming, this meeting of strangers who, through quite different social and cultural experiences had reached a common understanding. We worked together and I was instrumental in getting some of his work published. His first book, Asking the Earth, appeared in 1990. From him I learned much about India, its colonial history, the destructiveness of an invasive culture of consumerism in a country where the basic needs of more than 40 per cent of the people remain unanswered. Above all, he taught that social justice and respect for the environment are indivisible. If one takes precedence over the other, we fall into, either the uncritical acceptance by Marxists for industrialism, or into the error of a deep ecology which is prepared to save the planet even if the people perish. To give equal weight to social justice and to conserving the resource-base of the earth is a very radical project indeed: for this seriously challenges the existing developmental model which requires at the same time ever more extravagant abuse of the earth and growing inequality, all under the grandiose and banner of 'wealth creation'. Winin Pereira raises issues about different measures of wealth, other forms of justice, fresh definitions of human purposes, new ideas of well-being.

Winin Pereira was himself a curious and contradictory figure. Although he wrote all the time about overcoming the crisis of industrial society, he was not a practical man. I went with him once to the little hut in Alonde. It was extraordinarily beautiful • he could name every tree, shrub and bird; but the food we had taken was eaten by rats because we had failed to secure the cupboard door. Trying to cook something out of a tin over an open fire, we dropped it and went supperless. We laughed at the paradox that we were offering prescriptions for the survival for humanity, yet could scarcely survive a single night on our own. Indeed, without the practical and loving support of his family, Winin's work could scarcely have been abstained.

In the last decade of his life he rarely left his home. He was completely uncompromising, convinced that the existing paradigm would collapse, and that, whatever happened to the people of the West (whom he thought doomed, because of their total dispossession of survival skills by market-dependency), India would revert to traditional village self-reliant culture based upon the land and the local production of necessities. He could be intransigent at times; but was utterly incorruptible, refusing foreign funding, and maintaining a monastic dedication to his work, even though enfeebled by strokes and the onset of Parkinson's disease. He lived to see more and more people acknowledging the impossibility of the project of 'globalisation', which had over taken the internationalism to which he was himself committed.

Although I could not entirely share his apocalyptic view, nor regard the prospect of collapse of industrial society with the equanimity with which he viewed it. I came to love and respect him. He was a passionate man. ultimately optimistic, despite a certain melancholy. His was a search for just, sustainable and practical forms of development, justice for all those living now and for an indefinite number of future generations. He celebrated people's knowledge, and what he called 'liberation technology' over Western science, and if to some he appeared backward-looking, this was only in order to bring to the future some of the wisdom of the past that was being wiped out by a barren industrialism that only conjured new poverties out of the very wealth that was supposed to emancipate humanity.

Jeremy Seabrook 3 Springfield Aveniue
Muswell Hill London N10 3SU 19



The Heat Is On

Koodankulam and Climate Change

V *T Padmanabhan*

After the Pokhran explosions, the fund starved atomic energy programme in India has received u new lease of life. Work on the third and fourth power stations at Tarapur and Rawatbhatta has started. The Russian turnkey project for setting up two 1000 Mwe pressurised water reactors (PWRs) at Koodamkulam on the South East Coast has also been revived. In terms of installed capacity the Koodamkulam site will be more than that of all the 8 plants operating in four states in India. All further expansions *of* nuclear power in the country need be hailed, because of the well-known safety and economic problems.

Two of the three proposed sues. Koodamkulam on the East Coast and Tarapur on the west coast have serious safety problems, related to global wanning, rise in sea level and the cyclones and floods. This risk has not been part of the debate on nuclear safely in India

In 1995. the Intergovemmental Panel on Climatic Change (IPCC). a UN body made up of 2.500 scientists concluded that "a pattern on climatic response to human activities is identifiable in the climalological record", this human (rather inhuman) being the burning of fossil fuels and clear ance of forests, which cause an increase in the concentration of carbon dioxide (CO2) in the atmosphere, The current emission of CO2 is estimated at 7.5 billion tonnes a year, of which fossil fuel is responsible for about 6 billion tonnes. In spile of the pious fectaration at Rio-de- Jancino, the emission rate is increasing alarmingly, thanks to he intransigent position by US and lobbying work by the petromafia.

If the current trend continues, within about 15 years, major calamities can be expected *on* the coastal areas. According to IPCC projection of 1995. between 1990 and 2000 AD. global temperature will rise by 1.0 to 3.5 degrees Celsius (1 8 . 6.3 degrees Fahrenheit) Global average temperature was just 3 to 5 degrees C cooler during the last ice age than it is today. A warmer atmosphere and warmer sea results in greater exchange of energy which leads to tropical storms, tornadoes, thunderstorms and hailstorms. The projected increase in temperatures could increase the destructive potential of hurricanes by 50%. Storm winds as high as 350 kms per hours will not be unusual, The recent increase in the frequency and the destructive power of natural calamities experienced in India and globally has been linked to the climatic change.

While the causes of wanning are global and its prevention depends upon the activities of the global governments, its impact will be fell by local communities, in other words, even if the national government is helpless in reducing the global emission, protection of the areas under threat and measures to reduce the damage is well within the role of the national government. Global climatic changes do not appear to have figured in the agenda of the planners in India.

Work on Koodamkulam project is expected to commence in 2000 AD. The project might be ready in another ten to fifteen yean. Ifcommissioned in 2010 AD. the plants are expected to generate electricity for the next 30 years. After iu useful economic life, the reactors will stand there for another 100 years, which means, decommissioning will be complete in 2140 only.

During one year of its operation, VVER 1000 reactors will consume 60 tonnes of uranium, enriched to 3.5%. About 2 tonnes of U23S in the fuel bundle will be burnt (fissioned) in a year, leaving 58 tonnes of highly radioactive spent fuel, which will have plutonium, uranium and tens of fission and activation products. After removing from the reactor core, the spent fuel will be kept in a cooling pond for over a year. This will contain long-lived and highly radioactive elements. There will be about a tonne of plutonium, the raw material for bombs. Spent fuel is either reprocessed for extracting plutonium and unburned uranium or kept under surveillance till disposal methods are evolved.

As per the agreement, the spent fuel will be transported to Russia. This is very unlikely due to the increasing opposition to such shipments. Moreover, with a huge stockpile of fissionable material, Russia will not be very keen on taking back the dirty cargo. This means that at the end of their active life of 30 years, there will be over 1700 tonnes of spent fuel at Koodamkulam. A serious damage to the reactor structures due to flood and cyclone will lead to a radiological emergency of much greater impact than Chernobyl. If the incidence occurs when the reactors are on-line, the Chernobyl history will be repeated. The intense pollution of the marine ecosystem will be an additional feature.

The climatic catastrophe is equally applicable to other projects involving hazardous products. Nuclear plants stands out as a distinct class, because of the lethality and long life of the radionuclides involved. All construction work at the coastal stations has to be frozen until the ultimate safety of the structures is ensured. In the case of existing installations, detailed independent studies of the possible hazards need be undertaken. Preventive and ameliorative steps like bunding and afforestation are also to be considered.

Padmanabhan VI
(Padmaalu@ hotmail, com)

Koodankulam Safety Issues

Don't Rush in Where Others Fear to Tread

Dear Prime Minister,

INSAF and Vikas Adhyayan Kendra would first of all like to congratulate your government on your reported willingness to sign the CTBT. Signature of the CTBT will send an important signal to the world that India will avoid a costly and destabilising arms • race in the subcontinent whose final result could only be mutual destruction. In expressing itself as willing to sign this treaty, India has shown that it is responsible, and wishes to avoid the unthinkable.

INSAF is writing to you with the utmost respect, to express our concern over some aspects of the safety of the nuclear power plant project at Koodankulam.

The NPC has reassured us repeatedly that the design of plant chosen is 'completely safe'. According to Mr. S. K. Jain, chief engineer of the Koodankulam project, the Russian reactors are 'extremely safe' and have 'many significant safety enhancement features'.

According to a document given out by the NPC in Nagercoil. 'The design features for the proposed Koodankulam plants have been extensively negotiated. These include: ? The reactor shall meet all regulatory requirements of India and its designs have to be licensed by our independent regulatory body. ? The plant shall be capable of operating with high performance, reliably, and safely within Indian grid condition. ? It should have the latest design features and meet the latest international safety requirements.

It may indeed be the case that the VVER-1000/392 reactor design that has been chosen has some advantages over some western- style reactors, and it is indeed true that the VVER type reactor is not the same as the Chernobyl type RBMK design.

However, it is also the case that the WER-1000 reactor design in general has quite specific safety problems which Mr. Jain's reassurances do nothing to clear up, while the specific variant of the VVER 1000 design that has been chosen, the WER1000/392 design, will be the first of its type anywhere in the world.

This means that India will be building two of a completely untried reactor design.

The VVER-1000/392 reactor design is based on the VVER-1000/320 reactor design, which has many operating reactors in Russia and Eastern Europe. A variety of problems have arisen with attempts to complete and upgrade these reactors to so-called 'western' nuclear safety standards. While the commitment by the NPC to the latest international design standards is laudable, NPC makes no reference to the problems with the VVER320 model which have been indicated in IAEA documentation, especially with reference to the R4K2 plants.

These problems are set out by the International Atomic Energy Agency in a publication known as the 'Issues Book'. According to the Issues Book, these problems are the following:

The possibility that the steel reactor pressure vessel may become brittle, due to the effect of neutron bombardment of the steel. This would make it possible for the vessel to crack open violently during an emergency. This would probably (according to safety analyses by the US-DOE) propel the head of the pressure vessel out through the containment roof, causing a major radioecological catastrophe. The government, when the detailed project report is done, needs to ask very detailed and searching questions about steel composition, neutron flux, and RPV integrity.

The possibility that control rods may fail to insert properly during an emergency. This has already occurred at a number of VVER-1000 plants in Russia and Eastern Europe, as well as in French PWR plants. In many plants in France, costly replacement of the entire control rod mechanism has had to take place. Failure of the control rods to insert during an emergency is a serious failure, akin to having no brakes on a car.

The possibility that small tubes in the plants steam-generators may fail, leading to uncontrollable leakage of very highly pressurised and radioactive primary coolant into the low-pressure secondary system. This can lead to a loss of coolant accident with subsequent core meltdown if il is large, as well as causing damage to other parts of the plant.

- Problems with instrumentation and control systems and with properly integrating Western (presumably Siemens) control systems and Russian components, which have proven very difficult at the Temelin plant in Czech Republic.

- Problems with the detailed plant layout that have resulted in there being a particular spot in the plant where main steam-lines cross with important emergency systems. A main steam-line break such as might be caused by a big primary to secondary leak, can here result in the main steam line rupturing, and in turn destroying other essential safety systems. It is essential that when the DPR for Koodankulam is done that this issue of design be tackled.

I have outlined a series of specific issues that pertain to WER-1000 safety. It does not follow from this that only WER-1000 reactors or even only Russian reactors have these kinds of safety problems. These are in many cases problems that have been recognised for many years in Western (US, French and German) reactor designs also. It is simply the case that safety issues of one sort or another are inherent in ALL nuclear technology, and all reactor designs.

Nonetheless, it is worth asking why: (a) The VVER-440 reactor design, which in Finland and Hungary, has performed far more reliably than has the VVER-1000 and whose steam- generators in particular have operated much belter, was not chosen over the VVER-1000 design which has always had problems, (b) Why the Russian design for an 'inherently safe' reactor, the VPBER-650 design was not chosen.

Both these designs would have had much better operating and safety characteristics that the VVER-1000 design chosen, and the VVER-440 design was for some time under serious consideration by India.

Many of the specific design and safely issues involved are issues, which must be tackled during the process of detailed design and safely review. Presumably they will be tackled during the detailed project report.

It is therefore critical that the detailed project report be a public document, and that it be subjected to a process of formal public review,

Finally, the question must be posed as to whether any nuclear reactor development of this kind is in the interests of the Indian people. Analysis after analysis has shown that this type of development creates no benefits whatsoever for the poorer classes, and that it is also neither the way to prevent the greenhouse problem nor the way to provide energy: even electrical energy. Nuclear power, whether from Russia, the US. France. Germany or Japan, or India, is quite simply the most dangerous and expensive way to produce electrical power that has ever been devised.

INSAF is concerned that expenditure of the colossal sum of $3billion US. on two 1000Mw nuclear plants is an entirely inappropriate expenditure. INSAF believes that nuclear power in is not an appropriate solution to the energy problems of either Tamil Nadu in particular nor of India in general. We have deep reservations concerning the whole emphasis, which is being given both to Koodankulam and to the entire nuclear program in this country, and are convinced that far from solving our energy problems it will worsen them and divert resources that could be used in more socially useful ways.

We call on you to take most seriously the safety problems mentioned above. Please conduct a public review of the entire project with a view to determining whether or not it is truly in the interests of the people of India.

Finally we call on you to cancel the entire project forthwith if the above cannot be done, and if the safety problems associated with the project cannot be solved within a reasonable cost envelope.

WW
Vikas Adhvayan Kendniu

Fighting the powers...

continued from page 9

It is true that the southern districts of Tamil Nadu are industrially backward and they could use some economic boost But what arc the concerned people's interests" Do they want to industrialise at the cost of traditional agriculture? Arc they interested in a modern 'big bang' solution for the intractable problem of underdevelopment? There is a troubling silence on these issues.

In the final analysis, this unorganised fight against the nuclear power project in Koodankulam is by no means a powerful fight. Atleast not yet!

S. P Udayakumar who works as a Research Associate and Co-Director of Programs at the Institute on Race and Poverty, University of Minnesota, founded the 'Group for Peaceful Indian Ocean in I988 which sought to educate the public opinion against, among other issues, nuclear weapons and power. Udayakumar is from Nagercoil and visits his family often. He can be contacted through email (spkumar@to.umn.edu)

Dear Prime Minister, Please listen to Our Pleas

The following are some of the letters sent by people who love India and do not want it going down the nuclear hole. They were sent before the fall of the government.

Smedsby, Finland March 12th 1999

As a friend of Indian music and culture since my teens I am asking for your attention about something I find very important:

I have read that there are plans on building two new nuclear power plants in the south of India, next to the holy spot of Kanyakumari using VVER 1000/392 technology.

Regardless of the type of reactor you plan to use (and I understand that the VVER1000/392 has proved problematic for instance at Temelin and R4K2), I would like to point out that all nuclear power plants are dependent on technology that endangers the health of those who live not only near it, but both people and other living things around the uranium mines and other facilities necessary for producing nuclear fuel.

I feel the 3 billion US Dollars planned for this a project could be much better spent.

I would suggest using the money for environmentally clean projects instead, since there are poisonous and radioactive emissions not only from the power plants but also from the uranium mines. Also I understand there are unresolved safety issues with VVER1000 technology.

In Finland, where I come from (and also Nokia Mobile Phones!) there is a strong opposition against nuclear power, and indeed there has also been a government decision not to build any more nuclear power plants in Finland (we already have four reactors).

Sweden, the home of Volvo, Ericsson, SAS airlines etc., (and where I too lived 1979-91) also has had a government decision not to build any more nuclear power plants, but instead stop using the ones they have now.

Nuclear power has also proved so economically infeasible that there hasn't been a new nuclear power plant planned in the USA (where I suppose they are quite aware of what will and what will not generate money!) since 1974. Instead they have cancelled over 130 planned nuclear power plants, some of whose construction already had begun!

I suppose they would build more of them if it was economical? Thanks for taking your time to consider my points of view,

Yours sincerely,

St Sni Steinbock.
Sound Effects Master,
City Theatre of Vasa, Finland 65610
KORSHOLM FINLAND

stanibok@freenet.hut.fi

March 16, 1999

Dear Sir,

I love India and Indian people, visited India several times and even published the book "20 000 kilometres around India" (1968). And I am strongly against Nuclear Power Plant's constructions in your great and wonderful country

Troubled Russian nuclear industry are trying to survive through construction of the Nuclear Power Plants in India and China.

I can understand willing of India to have nuclear weapons for national safety reasons, but I can't understand Indian willing to have nuclear electricity. Chernobyl and Three Mail Islands nuclear catastrophes demonstrated how it can dangerous all modern nuclear electric technologies!

You are personally, not Russian-Minatom greedy engineers will be damned Indian people after inevitable nuclear catastrophe and radioactive pollution in Koodankulam or Kanyakumari.

One important reason why USA stopped in 70's to construct their NPPs was detailed calculations of the consequences and clear understanding that NPPs there are ideal weapons for enemies or terrorists. If India don't have unfriendly neighbours or if you do not have terrorists?

Prices for solar and wind electricity now lower that for Nuclear one. All coastal Indian territories have enormous potencies for the wave's energy.

And the last, but not the least, argument : we know that it is Russian government's credit, what give Minatom money for Indian NPPs construction. Now in Russia grouting protest against these credits, and it quite possible that it will be cancelled in nearest future.

1 pray to you, Sir, think out all these arguments and stop the development of Nuclear Power Plants in India.

Professor Alexey Yablokov
Author of the book "Nuclear Mythology" (1995,1997) Co-Chair, Program for Nuclear and Radioactive Safety of the International Socio-Ecological Union

Letterbox

Greetings! I am a Research Associate and Co-Director of Programs at the Institute on Race and Poverty, University of Minnesota, Minneapolis, US. I am writing to share with you my interest in the scrapping of the Koodankulam nuclear power project. In 1988 my friends and I founded the 'Group for Peaceful Indian Ocean' (GPIO) at Nagercoil and sought to educate the public opinion against, among other issues, nuclear weapons and power. The group became defunct when I came to the US in 1989 for higher studies. With the collapse of the Soviet Union, we did not think much about Koodankulam.

In June 1998 I wrote an article on the dangers that the Koodankulam project poses to the people of Kanyakumari district, and appealed to the President of India, the Chief Ministers of Tamil Nadu and Kerala, some of the Kanyakumari district legislators, and the local newspapers against the project. Quite expectedly, none of them had any time even to acknowledge the receipt of the letter. In the meantime, the National Alliance of Peoples' Movements (NAPM) and the International Physicians for the Prevention of Nuclear War (IPPNW) in Germany endorsed my call to scrap the Koodankulam project. Several individuals from various parts of India also expressed interest in the campaign against Koodankulam.

On January 9,1999 my parents (who live in Nagercoil), Aravinda, Ravi, and Krishna of Association for India's Development (AID), and I visited the Koodankulam project site and talked to many local people. On January 11, 1999 John Hallam and Mishka of Friennds of the Earth, Australia, visited Nagercoil. We all met with some local leaders who are interested in the Koodankulam issue. I left Nagercoil for Minneapolis on January 13th, and met Mr. N. Dennis, Member of Parliament from Nagercoil, by chance in Chennai, and told him the need to stop the Koodankulam project Mr. Dennis asked me to send him more details. I have recently been invited by The Hindu to write a short piece on the local peoples' movements against the Koodankulam project

In the meantime. John and Mishka have offered some three workshops on the risks of VVER reactors at Madurai. Tirunelveli and Nagercoil with the help of NAPM workers. Here is what John has written to me about the workshops: "Just a quick note to say that I held a workshop yesterday here in Madurai with Gabriella on VVER 1000 safety. Overall I would say it was pretty successful, though it may have been a bit detailed for some. It would have been ideal to take it more slowly. However, there was certainly plenty of interest in the topic! Roughly 25 people were there. While there we talked strategy a bit. Nothing canhshaking was decided, except that there should be an attempt to take the issue into the parliamentary and electoral arena, and that there should be a sustained technical attack on the project- which is best done by you, Surcndra, and myself. I (lagged the possibility that the two of us may try to get an international campaign based on the technical aspect going, as we discussed. I am certainly eager to do so. I'll be doing two further workshops in Tirunelveli on Feb 6th and Nagercoil on 7th (arranged by Sister Alfie)"

Here arc some ideas that cross my mind about popularizing and intensifying the Koodankulam struggle:

[1] Bringing together all those who are interested in this issue is, of course, the logical first step. We need to have local people in Kanyakumari, Tirunelveli, Thoothukudi, and other adjacent districts in Tamil Nadu, people in southern Kerala, and people in other parts of India.

(2) We can put together a mailing list and start circulating an informal short newsletter (both hardcopy and electronic copy) with some basic information on the project, latest developments, debates etc.

[3] We should ask people for ideas, suggestions and alternatives. We could have this debate for a few months and ask people to organize in their own respective areas.

[4] Then we may collectively come up with a consolidated protest movement. a concrete action plan, specific steps to take and so forth

[5] Some of us could initiate an international campaign based on the technical aspects of the VVER reactors

[6] Our primary objective should he having the project scrapped for good and forever.

[7] Only if we fail to kick the project out of Koodankulam completely, do we turn to compromises. negotiations on safety measures, peoples' participation in this and other crucial areas, job opportunity for the local people, etc But that is NOT the objective we begin the struggle with

Please do share with me your thoughts and ideas, and I would be happy to circulate them among us all and facililate further discussions. Also please tend me the addresses (and email addresses) of yourself and people who may be interested in this issue. Time is running out for us

Looking forward to hearing from you. 1 send you my best personal regards and all peaceful wishes.

P. S. The July 1997 issue of Facts. Against Myths, the monthly newsletter of Vikas Adhyayan Kendra (VAK, D. I Shivdham. 62 Link Road. Malad West, Mumbai 400064. India) has so much invaluable information on nuclear power. Please contact VAK at 882-2850,889-8662 (Phones). 889-8941 (Fax), or vak@bom3, vsnl net.in (email) for a copy of for subscription details.

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I am growing a little impatient about Koodankulam. But there is still lot of time I think. Because Roderigues (Kalpakam station director) has said that the construction work will start only a year later.

If we want to fight against this project, we have to get out of this local situation. 2000 MW of nuclear electricity in Tirunelveli is just not a local problem. At least, this has to be thought as a regional problem affecting T Nadu, Kerala and Srilanka. In my opinion the centre of the campaign should be Chennai. And to wake up people in Chennai, we have to inform them what a normally functioning nuclear reactor in Kalpakkam means for the people living in Madras. Secondly, besides Koodankulam, there is a 500 MW mwe fast breeder which is coming up in Kalpakkam. From a safety angle, this one is more serious than V VER 1000.

We have to do the following : Do some measurement of radionuclides in fish and other food items. We cannot afford to do it on payment. We will have to look for friends in laboratories abroad.

Conduct a health study in villages around MAPP. Part of the work can be done on a voluntary basis by Chennai based doctors. The primary investigators (women from the same villages) will have to paid. These persons can, later on, work in the campaign, if a local group takes up the initiative.

Study, the civil liberty violations by MAPP. Police firing and death of a fisherman who was caught fishing near the plant, midnight ransacking of a village, situation of the fishermen evacuated from the present site etc are themes to be included.

Do a video film incorporating the findings of the study. For this, we have the camera, and also the cameraman.

After this, we could hold a national seminar in Madras, inviting experts from NPC as well. Besides the above issues, we should also be asking the NPC about the measures they are going to adopt in the event of sea level rise and other problems which will come up in future.

While 10 years ago, we had the mainstream Tamil media with us. Today, almost all of them publishing pro-nuclear articles and news. Since the movement is not picking up, we should think of moving our self. One suggestion is personal meetings with writers and other prominent persons at district level. This can be done by young people, who are now on vacation. If you can locate a few such volunteers, they can undergo a short course at Vedchi and then set sail to all district headquarters. From my side, I am ready to do it in Kanyakumari, where my Tamil will work.

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Fight for a Nuclear-Free

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Rs. 360/ for life (only within India)

Demand drafts should be drawn on the State Bank of India, Valod (Code: 0531) For cheques and drafts drawn on other banks, please add Rs 10/- collection charges

Subscriptions, donations and enquiries regarding circulation should be addressed to:

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Published by S.Gadekar for sampoorna Kranti vidyalaya

Publication Date: June is, 1999

PRINTEDMATTER

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 12 Number 3 *December 1998 / J IW*

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The Imperiled Paradise

lor more than 50 years, India and Paki stan have been arguing and periodically coming to blows over one of the most beautiful places in the world.. The Mughal emperors thought Kashmir as paradise on earth. As a result of this unending quarrel. Paradise has been partitioned, impoverished and made violent. Murder and terrorism now stalk the valleys and mountains of a land once so famous for its peacefulness that outsiders made jokes about the Kashmiris' supposed lack of fighting spirit. I have a particular interest in the Kashmir issue because I am more than half Kashmiri myself, because I have loved the place all my life and because I have spent much of that life listening to successive Indian and Pakistani governments, all of them more or less venal and corrupt, mouthing the self-serving hypocrisies of power while ordinary Kashmiris suffered the consequences of their posturings.

Pity those ordinary, peaceable people, -aught between the rock of India and the hard place that Pakistan has always been!

And, as the world's newest nuclear powers square off yet again, their new weapons making their dialogue of the deaf more dangerous than ever before, I say, A plague on both their houses. "Kashmir for the Kashmiris" is an old slogan, but the only one that expresses how the subjects of this dispute have always felt; how, I believe, the majority of them would still say they (eel, if they were free to speak their minds without fear.

India has badly mishandled the Kashmir case from the beginning. Back in 1947 the state's Hindu maharaja "opted" for India, and in spite of United Nations resolutions supporting the largely Muslim population's right to a plebiscite. India's leaders have always relected the idea, repeating over and over that Kashmir is "an integral part" of India. (The Nehru-Gandhi dynasty is itself of Kashmiri origin.)

India has maintained a large standing military presence in Kashmir for decades, both in the Vale of Kashmir where most of the population is based and in mountain fastnesses like the site of the present flashpoint This force feels to most Kashmiris like an occupying army and is greatly resented.

Yet until recently the generality of Indians, even the liberal intelligentsia, refused to face up to the reality of Kashmiris' growing animosity toward them. As a result, the problem has grown steadily worse, greatly exacerbated by laws that threatened long jail sentences for any Kashmiri making anti Indian statements in public.

Pakistan, for its part, has from its earliest times been a heavily militarised state, dominated by the army even when under notional civilian rule and spending a huge part of its budget — at its peak, around half the total budgetary expenditure—on its armed forces Such spending, and the consequent might of the generals, depends on having a dangerous enemy to defend against and a "hot" cause to pursue.

It has therefore always been in the interest of Pakistan's top brass to frustrate peace making initiatives toward India and to keep the Kashmir dispute alive Thus, and not the alleged interests of Kashmiris, is what lies behind Pakistan's policy on the issue.

These days, in addition, the Pakistani authorities are under pressure from then country's mullahs and radical Islamists, who that acterise the stiuggle to "liberate" (that is. to seize) Kashmir as a holy was. But Kashmiri Islam has always been of the mild, Sufistic variety, in which local pirs. holy men. are revered as saints. This open hearted, tolerant Islam is anathema to the firebrands of Pakistan and might well, under Pakistani rule, be at risk

Thus, the present-day growth of terrorism in Kashmir has roots in India's treatment of Kashmiris, but it has equally deep roots in Pakistan's interest in subversion. Yes. Kashmiris fact strongly about the Indian "occupation" of their land; but it is also almost certainly true that Pakistan's army and intelligence service have been training, aiding and abetting the men of violence

The fact that India and Pakistan possess nuclear weapons makes urgent the need to move beyond the deadlock and the moribund 50-year-old language of the crisis. What Kashmiris want, and what India and Pakistan must be persuaded to offer them, is a reunited land, an end to Lines of Control and warfare on high Himalayan glaciers. What they want is to be given a large degree of autonomy; to be allowed to run their own lives.

The Kashmir dispute has already exposed the frailly of the cold war theory of nuclear deterrence, according to which the extreme danger of nuclear arsenals should deter those who possess them from embarking even on a conventional war. That thesis now seems untenable. It was probably not deterrence that prevented the cold war from turning hot, but luck.

So here we are in a newly dangerous world, in which nuclear powers actually are going to war. In such a time, it is essential that the special-case status of Kashmir be recognised and used as the basis of the way forward. The Kashmir problem must be defused once and for all, or else, in the unthinkable worst-case scenario, it may end in the nuclear destruction of Paradise itself, and of much else besides.

Salman Rushdie
The New York Times June 3, 1999

अणुमुक्ति

हिन्दी में उपलब्ध है।
अवश्य पढें और मित्रों को
ग्राहक बनायें।

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From The

The Broader Question

We maintain and hold that Muslims and Hindus are two major nations by any definition or test of a nation. Muslims are a separate nation by virtue of their distinctive culture and civilisation, language and literature, art and architecture, names and nomenclature, sense of values and proportion, legal laws and moral codes, customs and calendar, history and tradition, and, therefore they are entitled to a separate, sovereign existence in a home-land of their own,

M.A.Jinnah

I find no parallel in history for a body of converts and their descendants claiming to be a nation apart from the parent stock. If India was one nation before the advent of Islam, it must remain one in spite of the change of faith of a very large number of her children... You seem to have introduced a new test of nationhood. If I accept it, I would have to subscribe to many more claims and face an insoluble problem.

M.K.Gandhi

The conflict in Kashmir arises from the fundamental difference in these two viewpoints which despite the creation of Pakistan, has not been resolved till now. India is not a 'homeland* for Hindus alone and cannot survive as a nation of diverse cultural and linguistic units if it "gives away" Kashmir and no government in Pakistan can survive if it publicly stops trying to change the status quo. Are we then condemned to go on and on killing our finest youth time and again?

There arc some who feel that one can impose a "final solution" by not keeping in the shelf the greatest achievement of their respective 'scientists'. These people certainly deserve wide exposure. Unless the threat of total destruction that they convey becomes widely appreciated, these ideas will not of themselves die a natural death.

Even some otherwise sensible people have felt that one cannot have friendship with a rogue country that has waged a relentless war of terror within our borders over the past twenty years. The notion of "rogue" countries is a post Reagan US invention that needs to be thrown into the dustbin. There are no rogue countries: there are rogues within every country and quite often they hold power within governments. It is necessary for men of goodwill to relentlessly work to disempower these rogues within their own spheres and help other likeminded people in other countries to do the same. Working for peace is not merely a peacetime activity. It becomes even more relevant during times of strife when war-profiteering rogues have a field day.

Even before the war in Kargil began, activists walking in the Global Peace March from Pokran to Sarnath were abused and attacked with stones for having the temerity to talk of peace. Later there were requests from some that the march be postponed till after the elections, since with the hostilities in Kargil, it had become irrelevant-a dishonour to our brave dead. There is no doubt that those who have made the supreme sacrifice deserve the highest honour. But honouring their bravery and valour, does not mean that one support a state of affairs where such sacrifices are a periodic necessity. The finest tribute one can pay to these young men is to ensure the establishment of genuine peace.

Surendra Gadekar

HEADS THEY WIN, TAILS WE ALL LOSE

M. *V. Ramana*

For the first time since the 1971 war, Indian airplanes have been involved in combat Both armies started exercises near the border and the navies were on high alert Of special concern, however, is the fact that this escalation has happened soon after India and Pakistan have taken major steps towards developing a nuclear arsenal.

But in the middle of this crisis there have been statements that because both countries possess nuclear weapons the conflict will not escalate. While one has to be thankful if this does hold true, nuclear weapons do not provide any basis for such confidence. Such statements are no-lose propositions. If the war docs not escalate, then the pro-nuclear advocates can claim credit for having advocated nuclear weapons. If the war does escalate, they can claim that it is the lack of full-fledged nuclear capabilities. Depending on who you ask, what is required to prevent war could be a "minimum deterrent', a 'second-strike capability' or a triad. It does not matter how exactly these terms are defined because they keep changing continually. And, despite having nuclear weapons, if the war really becomes a full-scale one, then, of course, we are all losers. It does not matter that the pro-nuclear advocates were wrong at that point.

This notion that nuclear weapons prevent war, usually termed nuclear deterrence, has several inherent problems. Rather than anything physical, nuclear deterrence is just a psychological mind game. The idea is to ensure that one's nuclear and military might always intimidates the opponent. To keep the opponent in that state, every now and then one has to flex one's muscles. At such points, things can easily go wrong. In the current context, there are four points that are relevant.

First, the recent escalation in Kashmir is in itself a failure of nuclear deterrence. If nuclear deterrence were to hold in the way it is supposed to, then the two countries should never have gone to war. Even if one were to excuse the recent events as not quite a war, it does point to the fact that the leadership is willing and does take their people to the brink of the nuclear abyss.

Second, a careful look at the US-Sovlet experience, far from showing that nuclear weapons prevented war, showed that the two were willing to fight numerous proxy wars, especially in the third world. Over the decades they showed their willingness to fight it out to the last Vietnamese, the last Afghan and the last Angolan. India and Pakistan seem to be willing to do the same With the Kashmiris.

Third, as Kanti Bajpai points out, even the success of deterrence is actually "a colossal failure of the political imagination." If deterrence is successful, and remember that this is a big IF, then there is no incentive to work out problems with the "adversary." And, by freezing problems, nuclear weapons only entrench those on both sides who have an interest *in* permanent enmity. There are then no possibilities for normalisation and building friendships, the only way to have lasting peace. 11K people of India and Pakistan have, of course, no innate predisposition to hate and are quite capable of friendship. Hostility and mistrust is only a result of deliberate propaganda by groups and parties that thrive on hatred Among the citizens of the two countries, by and large, there is genuine affection, or at least curiosity, about the citizens of the other country. This is proved by the fact the Pakistan India People's Forum for Peace and Democracy, a group of independent citizens, meets every year, (spending their own money) and have reached consensus on supposedly contentious issues like Kashmir, nuclear weapons and religious fundamentalism.

Fourth, one cannot conclude that nuclear weapons keep the peace from the evidence so far. This is best illustrated by the old anecdote about a person falling off a tall, hundred-floor building. As he passed the 50th floor, another person asked him how he was doing. His reply was "Fine, so far." In the same way as this person would be crashing into the ground in a few seconds, the fact that nuclear war has not broken out so tar does not mean that it is not likely to do so in the future,

What then are the implications of the continuing clash in Kargil and what should be done? The obvious answer is that India and Pakistan should stop the war and normalise relationships between themselves In particular, it is vital that the Kashmir problem be solved And any solution of the problem should involve the people *of* Kashmir As in the ease *of* the Pakistan-India People's Forum, different people's groups have proven more capable than the governments in establishing the basis for friendly relations. Around the time of the Hague Peace Conference last month, a large number of Kashmiris, from Pannun Kashmir to pro-Mujahidccn, groups met for the first tune. They called for an end to all violence. for free dialogue between Kashmirs, and return to Kashmir's traditions of peaceful co-existence. It is lor the governments to help full-fill these dreams.

However, solving the Kashmir problem alone will not nd us of the nuclear dangers that confront South Asia. Witness the case of the US and Russia, where thousands of nuclear weapons are still waiting to be launched at each other within a matter of minutes despite the end of the cold war and the collapse of the Soviet Union over a decade ago. Like wise. India and Pakistan may well persist in holding *on* to their nuclear arsenals even after the Kashmir problem. And, then it would just be a matter of waning for the next crisis before these weapons are unsheathed and used.

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December 1998/ January 1999

Law Rather Than War On Kashmir

Dr Zia Mian

The long running low intensity conflict in Kashmir was bound to escalate. It was only a matter of time. At one level, the current fighting is simply another bloody interlude in a fifty year pattern of India and Pakistan alternately negotiating and fighting over Kashmir. However, things are made more dangerous by both states now having nuclear weapons and policy makers sharing a reckless strategic presumption that their respective nuclear shield protects them from the outbreak of real war or the possibility of defeat.

Kashmir is a symptom of a deeper underlying problem, as everyone knows. Think of the periodic chills and fever that are associated with malaria. More to the point, the disease is serious and given to chronically recurring. So far at least, the fatal complications common to untreated malaria have not set in. But this is not the occasion to dwell on this infectious disease as a model for nationalism, nor to try identifying the human analogues of the mosquitoes who bear this disease from one place to another and across generations, or the parasites who feed of the body politic and are responsible for fever. The need now is to seek help.

The major problem facing any effort to break the impasse between India and Pakistan over Kashmir is that the two states disagree fundamentally on the terms for talking about the issue. Pakistan insists any discussion has to be based on the 1948 and 1949 UN resolutions on Kashmir; corning after the 1947 war, they envisaged the United Nations Commission for India and Pakistan supervising a settlement "in accordance with the will of the people" of the region. India claims primacy lies with the 1972 Simla Agreement; signed after the 1971 India-Pakistan war the treaty commits the two states to settle their disputes "through bilateral negotiations or by any other peaceful means mutually agreed upon between them" and makes no mention of the UN. Kashmiris are rarely consulted by either state or the international community.

These positions have stalled any effort at a settlement and in fact contribute to the resort to force. Fighting along the Line of Control allows Pakistan to ask for international mediation, For hard-liners here, the more severe the fighting the greater the incitement (they hope) for the international community to talk about Kashmir. Thus Pakistan fans the flames. This however creates pressure for Indian hard-liners to settle the issue directly by force of arms. No Pakistani support for Kashmiris, no problem.

There may be a way to break out of this potentially terminal dynamics. It requires intervention. But not necessarily intervention of the kind that Pakistan has traditionally aimed for, nor India traditionally refused. Rather than a single state or group of states riding to the rescue on Kashmir as if they already knew what the answer to the Kashmir dispute was and imposing it by force, the United Nations General Assembly could take a legal initiative. The General Assembly could choose to ask the International Court of Justice for an advisory opinion on the standing within international law of India and Pakistan's claims over Kashmir, the existing UN resolutions on Kashmir, bilateral treaties and agreements dealing with the dispute, and the right to self-determination of the Kashmiris.

The International Court of Justice (otherwise known as the World Court), based at The Hague in Holland, is the highest legal authority within the United Nations system, and thus within the international community. The UN Charter provides the General Assembly the right to ask the World Court for an "advisory opinion" on "any legal question." This "opinion" is not directly binding on the UN or its member states or even enforceable. It is however understood to be authoritative as a statement of the law. There is precedent for the United Nations General Assembly using it power to ask the World Court for such an "advisory opinion." Most recently the General Assembly asked the World Court whether the **threat or use of nuclear weapons** was permitted under international law. The World Court ruled in July 1996, declaring the threat or use of nuclear weapons to be generally illegal.

The bottom line is that the UN General Assembly simply has to pass a resolution asking the World Court for an "advisory opinion " It has to be said that the World Court can refuse a request, but only if there "compelling" reasons. It would be hard to see what "compelling" reasons may arise in the case of Kashmir.

This is not the place to consider what either India or Pakistan may do, what arguments they may put in front of the Court, or the justifications they may offer for refusing to speak to the Court, or even the possible eventual opinion of the Court. The point here is to offer a suggestion about a process. It offers no shortcut to a solution. The process would seek to clarify what could be a shared basis for the international community for a solution to Kashmir.

It could be argued that since the World Court would offer only an "advisory opinion" it would make no difference either to India or Pakistan. They could choose to ignore it, and the status quo would prevail. However it is the fact that the UN General Assembly would be taking the action that gives this proposal significance. For want of a better institution, it is the closest thing to a forum for expressing collective aspirations and understanding by the system of states. Once the General Assembly sets out to seek a legal basis for the international community to take a position on Kashmir the context within which India and Pakistan argue their case about Kashmir would change. India and Pakistan would have to decide whether they were prepared to defy the wish of the world community and by so doing jeopardise what international support presently they may have for their position.

Depending on the Court's judgement, India or Pakistan (or even both) may well find itself isolated on Kashmir. This would be a big blow that either would not be able to accept indefinitely, especially if the international community kept insisting that the Court's judgement be used to take some action. The Court's judgement on the general illegality of nuclear weapons has been the basis for nuclears manding disarmanent that now contect some 130-150 supporters in the General Assembly, increasingly' isolating the nuclear weapons states. If this should start to happen on Kashmir, it would be hard if not impossible for India, or Pakistan, (or both, depending on how the Court decides) could remain defiant for very long. They would be taking on the whole international community backed up by international law.

Using the opinion of the Court, whatever it happens to be, the international community could make it clear to both India and Pakistan that there existed a new legal basis for a legitimate solution to the Kashmir dispute and they would have to work within it if they expected any support from the rest of the world. At the same time, a solution based on an independent interpretation of international law could help politicians in South Asia • if they wanted it to. For the first time there would be an alternative to the long held positions that could be argued to be even more legitimate. Leaders in India and Pakistan would have the opportunity to modify their positions and justify this to their constituencies on the grounds the World Court decision left no alternative. In this, for once, they would be right. There should be no alternative to resolving international disputes except through law.

From: The News on Sunday (Pakistan),
June 13. 1999

ANUMUKIT? No Way,
Neither is it ANUSHAKTI
It is and remains

ANUMUKTI

There has been a lot of confusion reganting our name. So much so that even we blundered and called ourselves Anumukit on the banner in the last issue. But no one noticed That shows the amount of familiarity our name has achieved Hopefully it hasn't bred contempt.

LETTERBOX

The editorial appearing in the RSS mouthpiece "Panchajunya" (June 20). makes alarming reading. It raises serious questions about India's security. The editorial openly advocates dropping of nuclear bombs over Pakistan, as a solution to long standing Pakistani hostility. It also asks in a rhetorical fashion as to why India carried out tests of nuclear weapons in it was not meant to be used. It calls upon Prime Minister Atal Bihari Vajpeyee to he the man of destiny by dropping nuclear bombs on Pakistan and to go down in history as the man who brought about the "final solution"

The total unconcern regarding destruetion of human life on a massive seule displayed in the editonal is not just appalling but extremely treightening as well, It shows abject moral bankruptcy and reveals a mindset which, it given opportunity, would think nothing of erecting concentration camps and gas chambers.to "solve cultural and civilisational" problems.

This view is equally disturbing even from a purely tactical point of view The evboration reveals an abysmal ignotance about the apocalyptic nature of nuclear explosions Not only that, the editornal also shows criminal disregard of the fact that such insane outeries would radically increase the possibility of a pre-emptive nuclear strike more so, given the fact that there is no dearth of lunatic and cowardly elements within the Pakistani ruling establishment as well.

In ordinary times, one would dismiss these views as intolerant outpourings of men tally deranged men and ignore them. But in the present contest to do so will he suicidal as the RSS happens to be the de- facto extra-constutional centre of power in India, In view of the above, the nation has a right to know from the Prime Minister Mr. Vajpayee a self-confessed RSS man. as to what is his stand on the use of nuclear weapons. In fact. Mr Vajpayee, must forthwith openly *and* categorically dissociate himself from the RSS view in clear and unequivocal terms Failing this, the President shall secure his removal from the office of the Prime Minister, because the country is not safe even for a moment in the hands of a man who holds such views on nuclear weapons

Dr. Smita Puniyana
IIT Bombay

A Call For Sanity and Amity

The Indian and Pakistani forces have for many years, exchanged fire along the Line of Control in Kashmir. Th*e* ongoing Border War in the Kargil Sector of Jammu and Kashmir has been a matter of grave concern, as this may well lead to an all-out war, with disastrous consequences for the peoples of both nations As both countries have now become nuclear weapons capable,' there is serious risk of these weapons being used, by accident or design thereby adding an unimaginable new and hotrifying dimension to this entire conflict

The current violation of the LOC by the Mujahideens/infilirators, assisted by Pakistani Armed Forces, has led to this unfortunate situ ation. However the root cause for these recurrent violations lies in the non resolution of the long standing Kashmir question ' Despite being signatories to both the Simla Agreement and the recent Lahore Declaration, which specifically highlights the resolution of all disputes by peaceful means and negotiation, we find ourselves locked in yet another round of hostilities.

Before things get out of hand, we would like to impress upon the political leadership in both our countries the urgent need to cease all military activities, and to take steps to restore peace and stability in the region This, we be-Itevc, can only be achieved by resorting to negouations in the spirit of the Simla Agreement and the Lahore Declaration, to arrive al a per manent and acceptable political resolution of the dispute.

Admiral L Ranulas
Chairperson India Chapter
Pakistan-India Peoples Forum
far Peace and Democracy
June 18, 1999

The Nuclear Danger Is No Fantasy

Praful Bidwai

owever one looks at its genesis and its remarkably inept handling by New Delhi, the Kargil crisis highlights, as nothing else, the sub-continent's strategic-volatility and the fragility of the Lahore process. If the Indian army had to wait till May 6 to be informed of the unprecedented large-scale intrusion by a shepherd, and then took six days to report this to the defence ministry, and if the ministry two days later still said the infiltrators only occupied "remote and unheld areas", then there is something deeply wrong with our security decision-making. The sudden switch from smugness and inaction to high-profile air strikes with their high-risk escalation potential testifies to the same flaws. One year after Pokaran-II, these put a huge question-mark over nuclearisation's claimed gains. The Bomb has comprehensively failed to raise India's stature, strengthen our claim to a Security Council scat, expand the room for independent policy-making, or enhance our security.

India stands morally and politically diminished: a semi-pariah state to be equated with Pakistan, and periodically reminded of Security Council Resolution 1172. Most Third World countries see India as contradictory: a nation that for 50 years rightly criticised the hypocrisy of the Nuclear Club, only to join it; a country that cannot adequately feed its people, but has hegemonic global ambitions. Our neighbours, crucial to our security, see us as an aggressive, discontented state that violated its own long- standing doctrines without a security rationale.

After prolonged talks with the U.S., in which we put our "non- negotiable" security up for discussion, India remains a minor, bothersome, factor in Washington's game-plan as a non-nuclear weapons-state. South Asia's nuclearisation has enabled Washington to grant Pakistan what Islamabad has always craved, and which New Delhi has always denied it, viz parity with India. Today, India and Pakistan act like America's junior partners. Washington last August drafted both to smash the unity of the Non-Aligned in the Conference on Disarmament on linking PMCT talks with the five NWSs agreeing to discuss nuclear disarmament. If nuclearisation had enhanced our capacity for independent action, we would not have been mealy-mouthed on the U.S. bombing of Sudan and Iraq nor capitulated to unreasonable U.S. demands on patents. Nuclearisation has put India on the defensive in SAARC and ASEAN, in NAM and the World Bank. Damage control remains the main preoccupation of our diplomacy one year after the mythical "explosion of self-esteem". Worse, nuclearisation has drawn India into dangerous rivalry with Pakistan and China. India has eight times more fissile materia) than Pakistan. But in nuclear, more isn't better. The truth is, India has become for the first time vulnerable to nuclear attacks on a dozen cities, which could kill millions, against which we are wholly defenceless.

Security based on deterrence is nothing but hope masquerading as strategy!

By embracing the "abhorrent" doctrine of nuclear deterrence, we have committed what we ourselves used to describe as a "crime against humanity" This article of faith assumes that adversaries have symmetrical objectives and 'perceptions; they can inflict "unacceptable" damage on each other; and will behave rationally, 100 per cent of the time. These assumptions are dangerously wrong. India-Pakistan history is replete with asymmetrical perceptions, strategic miscalculation, and divergent definitions of "unacceptable". For fanatics, even a few Hiroshimas are not "unacceptable". Deterrence breaks down for a variety of reasons: misreading of moves, false alerts, panic, and technical failures. The U.S. and USSR spent over $900 billion (or three times our GDP) on sophisticated command and control systems to prevent accidental, unintended or unauthorised use of nuclear weapons. But the Cold War witnessed over 10,000 near-misses. Each could have caused devastation. Gen. Lee Butler, who long headed the U.S. Strategic Command, says it was not deterrence, but "God's grace", that prevented disaster.

Generally disaster-prone India and Pakistan will have no reliable command and control systems for years. Their deterrence is ramshackle, if not ram-bharose. A nuclear disaster is substantially, qualitatively, more probable in South Asia than il ever was between the Cold War rivals. Kargil starkly highlights this. It would be suicidal for India and Pakistan to deploy nuclear weapons and then "manage" their rivalry. They must never manufacture, induct or deploy these weapons. India must not erase her own memory. For decades, she correctly argued that deterrence is illegal, irrational, strategically unworkable, unstable, and leads to an arms race. The "minimum deterrent" proposition does not weaken this argument's force. Minimality is variable and subjective, determined not unilaterally, but in relation to adversaries. Embracing deterrence means entering a bottomless pit. That is why the NWSs' "hard-nosed" realists ended up amassing overkill arsenals—enough to destroy the world 50 times. The danger that India could get drawn into an economically ruinous and strategically disastrous nuclear arms race, especially with China, is very real.

Consider the larger truth. Nuclear weapons do not give security. Because of their awesome power, their use, even threat of use, is determined less by military, than by political, factors. That is why America cannot translate its enormous atomic prowess into real might Nuclear weapons have never won wars or decisively tilted military balances. Korea, Vietnam, Afghanistan, Falklands, the Balkans, all expose their a-strategic nature. They are not even effective instruments of blackmail. State after state, from tiny Cuba to China, has defied nuclear blackmail attempts. Nuclear weapons are false symbols of prestige. But they are ruinously expensive. To build and maintain a tiny arsenal, about a fifth of China's, will cost about Rs. 50,000 crores. This will further inflate our bloated military budget. Already, New Delhi spends twice as much on the military as on health, education and social security put together.

With Pokaran-II, and now Kargil, Kashmir stands internationalised. It is widely seen as a potential flashpoint for a nuclear confrontation. Largely symbolic events like Lahore, while welcome, do not alter the causes or conditions of Indo- Pakistan rivalry. The Lahore agreements do not even commit the two to slow down nuclear and missile development, only to inform each other of their tests. Such limited confidence-building can easily collapse, as Kargil vividly demonstrates.

Add to this debit side the enormous social costs of militarism, tub-thumping jingoism and male-supremacist nationalism; of further militarisation of our science; legitimisalion of insensate violence; and psychological insecurity among the young. The Pokaran balance-sheet looks a deep, alarming, red. But there is good news too: nuclear weapons aren't popular. According to recent polls, 73 per cent of Indians oppose making or using them. After November's "Pokaran- vs-Pyaaz" state elections, politicians know that nukes don't produce votes. And now, Kargil should induce sobriety. For sanity's sake, the nuclear genie should be put back into the bottle. What human agency can do, it can also undo.

The Times of India, June 2.1999

Doing Unto Others

K.P.S.Gill

Ig the emergencey and for some years after that as well, (I belong to the generation which can still remember the emergency!), Arun Shourie was one of my heroes. But read him now! The guy wants that we shouldvupply arms and encourage insurgency in Pakistan, Have we learnt nothing from the sorry episode *in Sri Lanka, Therefore it is a special pleasure to publish the following article from the most unlikely source. K.P.S. Gill is the person most closely connected with the police rule in the Punjab during the insurgency there.*

is tempting and there are some who now vociferously advocate that we do to Pakistan what they are doing to us. It would be easy to arm and instigate the growing armies of malcontents in Pakistan, pushing that nation into a spiral of violence and anarchy. The Punjabis dominate the armed forces and governance in Pakistan. The people of Sindh. Balochistan and NWFP are alienated. So are the Mohajirs. Even the minority Islamic sects like the Shias and the Ahmediyas have serious grievances. It would be easy to inject a spark of provocation into this incendiary mix of mutual animosities.

This is an option that India has consistently, and rightly, refused to exercise. The proof of the sagacity of this choice is available in Pakistan itself. Pakistan celebrates the destruction of Afganisthan through its strategy of Talibanisation as a great victory; but this is the beginning of its own eventual probable disintegration. As the ravaging armies of Islamic fundamentalism return to Pakistan, their attention may be temporarily diverted to Kashmir and India; but they will in time inevitably claim what they now regard as their own. In our age, when nations provoke and support campaigns of violence and terrorism in their own neighbourhood, they inevitably fall victim to the scrooge themselves. A victory for terrorism anywhere in the world today is a victory for terrorism everywhere

That is why the pursuit of peace if India's best, indeed only, option. And that is why. to a realist, the conflict in Kargil only reiterates the fact that, in a war between India and Pakistan, there never can be a victory, we must defeat the fundamentalist ideologies that threaten to plunge the entire region into a conflagration that may well destroy us alt. The greater war that we must now engage in is the war for minds.

All fundamentalist creeds preach an identical message of exclusion and hatred These malignant doctrines, and not Islam. motivate what the fanatics in Pakistan and their supporters elsewhere, call the jehad in Kashmir. The mullahs of Pakistan have reduced the teachings of one of the great religions of the world to a travesty, brainwashing young men many of them mere children - to commit murder, and to die, in wayward wars of aggression on foreign soil. But this blasphemous treed of haired and slaughter offends against all religion. Indeed, if Pakistan seeks a righteous cause for jehad it would find it within its own borders - for Islam is far more secure in India today than it is there But such a jehad, must be conceived of in terms of an act of spiritual purification, not the intolerant and spiteful violence of the bigots who presently pervert the destiny of Pakistan through a falsification of their faith.

India has an immense advantage in the ideological war against extremism, the tolerance and diversity of its Constitutional creed But this creed must be translated into policies that will create a society less inequitable and far more humane than the one we have today. If we can achieve this, we will win votaries to this faith even among those who have, beyond our borders, been nurtured on a haired of the, very idea of India. And that would, indeed, be a great victory.

From: *The Times of India*

Plastic Patriotism in Wartime

Nivedita Menon

WAR brings super-profits to arms-dealers. And to patriots. Overnight, individuals quick to seize the opportunity have publicised their own names on hoardings in Delhi, urging our boys to die anonymous deaths in the icy wastes of Kargil — *dekhna hai zor kitna bazu-e-quatil mein hai,* they declaim. Kill a thousand, the enemy is warned, we have thousands more where these came from. Thousands of young men for whom the army means a livelihood, a way of looking after desperately poor families

> Since April 13,1984, Indian and Pakistani troops have engaged with one other, eyeball to eyeball, for control of the 76-km long glacier. At Rs 3 crore per day, the Indian Army's expenditure for maintaining control over the icy heights, over 5557 days amounts to a whopping Rs 16,601 crore

When Field Marshal Sam Manekshaw made a public statement to this effect a couple of years ago, all his tested and proved patriotic valour was set at nought, and everyone, from retired army generals to politicians, was baying for his blood. Strip him of his titles was the mildest demand from men who were greater patriots than poor Sam could ever be. Greater patriots they, than the mother of the soldier killed at Kargil, who, dry-eyed, said to reporters when his body was brought home to his village in Kerala, "All the boys dying there are my sons, Indian and Pakistani. What is the use of this war?"

Of course our soldiers are patri-otic and self-sacrificing, They do it for the rest of us, who can prove our patriotism by putting up bill boards. Or by clicking on web sites. Or take the boys of Akhil Bharatiya Vidyarthi Parishad, who organised a function in Delhi University to give their blood for Bharat Mata. Solemnly they cut their thumbs and applied tilak to the cardboard forehead of a cardboard figure. Cardboard patriotism.

New Links

Do I care at all that young men are being killed in terrible ways out there in inhospitable, uninhabitable terrain? That the bland phrase hand-to-hand combat means intimate, terrifying face-to-face death? It is because we do care that hundreds of thousand of us protested at India's bomb in towns and cities all over the country, anonymous people, students and housewives, professionals and workers, academics and journalists. We protested because our patriotism lies in a longing for peace, for a world in which we do not have to send our young boys to kill and be killed, and because we knew that the bomb would destabilise the region and create a series of confrontations. We were derided by the strategic experts who said the bomb meant peace. They said having the bomb meant both parties would be more circumspect.

4t gives us no joy at all in being proved right. But we were. And I believe that we are rigty now, those of us who say that this particular episode cannot be seen in isolation that Kashmir is an issue which has to be resolved, and diplomatically, not by irresponsible warmongers flexing their muscles and sending other people's sons to their deaths. That it clearly cannot be handled bilaterally any more, but that we do not want the G-8 to come barging in. (How drearily unsurprising the very media which trumpeted its anti-imperialism in welcoming the bomb is bursting with pleasure and pride now that Uncle Sam has patted us on the head with his own bloodied hands)

Logic of Borders

The Kashmir issue is internationalised already. The question is do we now cave in to the world police? Or can we move towards forging new links in the Third World? Through Asian, particularly South Asian intervention, and through the mediation of world leaders of stature like Nelson Mandela, Fidel Castro, Yasser Arafat. Every day someone's son iskilled in Kargil. Does his death really mean nothing to us if the flag covering his body is their green and not our tricolour? But "they" tortured "our" men. That is truly horrifying, and the pain of the families unimaginable. But arc we still talking of war here? And of armies?

For wars are fought to win. If you don't win, you lose — there are no awards for fine sportsmen. The point of a war is that whoever is fought against is the enemy, whether it is another country or "anti-national elements" within our own. That precisely is the business of the army, to win by any means possible. If these things have never bothered you, why the sudden invocation of courtesy and codes of conduct? But there are many of us whom these things do and have bothered, and we have always protested the violation of human rights by the state. We simply don't see the logic of borders which must, be defended to the last citizen. For ours is the doubtless quirky belief that people are the nation, not borders, not big dams, not nuclear might. What is yours? Identical twin mushroom clouds over intact borders?

From Tunes of India
(The author was involved in the data collection during the survey of health effects at Rawatbhata nuclear power plant in 1991)

Real War is Against Hate and Anger

Rajani Bakshi

Violence we are told is sometimes necessary. Thus, killing (he intruders on our borders is not only justified, it is a heroic act. After all, they attacked us. There is valour in defending yourself with the able use of weapons.

While our soldiers do the actual killing, moreover, it is considered necessary for the rest of us to hate the 'enemies' vigourously, zealously cultivating and maintaining anger against them. Therefore, we have the phenomenon of fire-crackers being burst to 'celebrate' the defeat of Pakistani team in the World Cup final. There seems to be an almost vicious glee at that crushing defeat of our brothers turned neighbours turned enemies.

Still, let us pause to consider the Puranic tale about two great warriors who were locked in hand-to-hand combat. Both were highly trained Kshatriya princes. They fought long and hard, until one of them fell to the ground. As the would be victor raised his sword to strike the final blow in the conflict, he saw a cringing fear in the eyes of his opponent. This made him angry, A Kshatriya warrior is not permitted to feal or show fear.

Immediately, the victorious warrior withdrew. "Go," he said to his flattened opponent. "I cannot kill you in anger." In that princes world-view, a fair martial contest, even leading to the death of one participant, is a fulfilment of his swadharma or duty. But the moment anger or hatred enter into such an action, it is reduced to violence and thus becomes sinful.

Cannon Fodder

The same story appears in the Japanese tradition. A warrior set out to find and punish the man who assassinated his guru. For two years he searched high and low, finally tracking down the culprit in a forest cave. At the end of a bitter duel, the assassin fell and was about to be struck dead. At the last moment, the fallen man spat in the face of the victor, who became enraged and immediately pulled back. He could not carry out even a deserved punishment in anger. Instead, he let his opponent go, vowing to track him down yet again and carry out the execution in a fating manner.

Such stories offer little comfort to the modern soldier, who seldom comes face to face with his opponent, but fights with, and falls to, long-range weaponry. Is this why anger and hatred are now regarded as necessary weapons on both sides? In the absence of these emotions, we might begin to realise that soldiers on both sides end up being used as cannon fodder.

Instead, we seek to give meaning to the death of 'our' soldier by remembering his everyday humanity. In doing this, we make ourselves forget that the same is true for 'their' soldier Perhaps we fear that, if we think about the children on both sides whose daddies will never come home, our anger against the bad guy, 'Other' will be sapped,

Even if it is true that their violence came before ours, hatred and anger arc *never* neutralised by counter- hatred and counter- anger. It is anger itself which is the only real 'bad guy' in the story

Not Utopian Idealism

It seems sacrilegious to suggest that the fallen soldiers and innocent civilians on both sides are actually the victims of those who foster anger and conflict. For, once we have accepted this, we all become accessories to the crime. Haven't most of us joined in the easy practice of hatred at some point?

One possible escape from this into recognise that the real enemy is a mind-set which holds strife to be the inevitable lot of humankind. But, to contradict that now famous piece of pop lingo, "We are not like that only "

There is an enormous power behind the conviction that we are here to pursue a higher evolutionary destiny. It is not utopian idealism to believe that the human species is slowly but surely evolving towards higher levels of being. Neither is this an esoteric and remote ideal. We can all participate in it by our daily actions. We can do this by seeing the conflict on our borders differently by refusing to participate in a seemingly endless cycle of conflict and hatred.

* * *

The best tirbute to the soldier who is laying down his life is not to vow further 'vengeance. Rather, we can work to ensure that his family will live in peace and his children will never be called to serve on any battlefield. Enough of us have to feel this way on both sides of the border, and act on our convictions, to prevent governments or terrorist groups from warring - either on our behalf,
or against us

* * *

South Asia: A Plea for Peace

The never-ending process of defence build-up in the Indo-Pak Subcontinent, will have to be, no matter what the ground situation, carefully tcrutinised and a balance struck between perceived military threats and the real risk of a dramatic economic crash.

Despite the crushing poverty of their respective populations, the two countries are spending approximately $ 30 billion a year on defence, twice as much as Saudi Arabia, a country 25 times wealthier. Both countries have six times more soldiers than doctors, in a region where epidemics, disease, starvation and death are rampant. How tragically comic that after bleeding their economies, the two governments, despite high and lofty slogans of breaking their respective begging bowls, continue to beg and submit to all sorts of conditionalities from IMF, World Bank and other international lending institutions.

Nations have no strength when their people starve, groan and grieve under immense economic hardships. South Asia trails behind while the rest of the developing world surges ahead. 800 million South Asians do without elementary sanitation, hilly 380 million are illiterate, and 300 million drink from ponds rather than taps. South Asia is just not prepared to enter the 21st century. It does not invest enough in its people.

India hopes to be a regional superpower, but cannot become one with the scale of sheer poverty that exists. The lesson of Cold War rivalry is not that capitalism triumphed over communism, but that political power not backed by economic strength is unsustainable. The Soviet Union collapsed because it could not feed its people. All its tanks, submarines and secret service meant nothing in the ultimate analysis.

Economic policies being pursued in the region are unlikely to improve the conditions of the vast majorities in these countries. The defence budgets of the region devour an overwhelming amount of revenues, followed by loan servicing and maintenance of a huge inefficient bureaucracy, with very little left for the social sector. For instance, Pakistan's military spending for the year 1996-97 was Rs. 115 billion. This means spending Rs. 316 million every day, Rs. 13 million every hour, Rs. 219,280 every minute and Rs. 3,654 every second, on the military. A day's saving on military spending can be spent on the development of one city. It costs about a million rupees to build a primary school in a village. By saving on arms we can pay for building over 100,000 schools in one year. It costs Rs. 2 lakhs to install a new tubewell for a village. By saving on arms we can pay for installing over half a million tubewells in one year.

Economic growth is not enough; there has to be distributive justice. Three decades ago, Pakistan had one of the highest rates of growth in the developing world - seven per cent a year. So why were people protesting on the streets? The reason was that economic growth had not touched their lives • Income distribution was skewed against the poor. The lesson was clear: you have to put people at the centre, enrich their lives, and provide them with options.

Amidst all the gloom, South Asia itself provides examples of the dynamism that can be released when human lives are made the focus. In Bangalore, once they started training people in computers, the industry took off and India is now the second largest exporter of software in the world. Before 1971, what was then East Pakistan, did not have significant industry. Today Bangladesh has out-competed India and Pakistan; it exports $2 billion worth of garments to North America and Europe. India and Pakistan must take the lead and turn South Asia away from the abyss.

The SAARC organisation has remained an exercise in protocol without substance. Beyond the realm of mutual distrust and consensual antagonism, SAARC must be energised and revitalised. Instead of issuing Utopian declarations at the culmination of each meeting, a down-to-earth approach should be adopted. Each member of SAARC must agree under a multilateral agreement to cut live per cent of military spending annually, and to earmark the money released for education and health. Having proved beyond doubt that they are established nuclear powers, India and Pakistan must also come to an understanding on the nuclear issue. Now is the time to act in a sensible, rational and prudent manner, sit down and talk about 'human' and 'social' issues, so that the enormous resources can become available for social needs.

The existing political structures of India and Pakistan are not conditioned to accept proposals such as these. For mis reason, the people should take the lead, through energetic advocacy and use of the increasingly powerful and border-less media. It is time for civil society to conduct a 'bypass operation' around reluctant politicians, who are never willing to stake their lives and reputations for social justice. Those who seek to restore normal dialogue and bring down the walls that separate people, can begin from a base that has survived years of undue, tension and confrontation. Participants in the Indo-Pakistan People's Forum, for example, or the Neemrana initiative, recognise a simple truth, that political obstacles to a normalisation of relations will be removed only by a demonstration of popular will by ordinary citizens. Today, the people of both sides of the divide have the opportunity to replace the language of confrontation with the vocabulary of reconciliation, to bring the sufferings of the Kashmiri people to an end, to reverse the economic deterioration of a region with enormous potential and to join the rest of the world in dealing with the threat we inevitably face and the promise we can all share.

Of course, there are tremendous vested interests in the power structures of the two countries. There is little understanding of the social opportunity costs of buying more and more sophisticated armaments. But why should we assume these are immutable? Every where outside our subcontinent, people are leading change, which comes about much faster today because ideas cross borders much more easily. We should, therefore, let the talk of missile development and nuclear proliferation give way to talk of human development. Let the job of building confidence begin and the history of mistrust and suspicion come to an end. Let the great civilisation of this extraordinary part of the world flourish once again. Let the voice of its poets speak of peace. Let merchants and traders of business interact ; let good now freely between markets. Most important, let our children live, without fear and without rancour, united in hope, speaking thecommon language of a people at peace with themselves.

Ahson Saeed Hasan
The Nation Wednesday. July 7.1999

Shame On Us

In a new report published on July 16, Human Rights Watch charged that human rights violations by all parties in Kashmir have been a critical factor behind the conflict.

The report says that if those violations had been seriously addressed at any time over the last ten years, the risk of a military confrontation between India and Pakistan might have been reduced. The escalation in fighting has made it urgent that the international community put pressure on India to end widespread human rights violations by ils security forces in Kashmir, and on Pakistan to end its support for abusive militant groups.

"The diplomats have focused on getting India and Pakistan each to stay behind the so-called "Line of Control,'" said Patricia Gossman, senior researcher with Human Rights Watch. "But repression and abuse on both sides are keeping this conflict alive. Unless there is pressure on both India and Pakistan to end the abuses, international diplomacy to defuse the conflict is bound to fail."

The 44-page report, Behind the Conflict in Kashmir, focuses on the border areas in southern Kashmir where militant forces have been crossing over from Pakistan. The report documents several of the massacres of Hindu civilians carried out by these groups and their local counterparts, in which more than 300 civilians were killed between 1997 and mid-1999.

In response to these attacks, Indian forces in the area have retaliated against local Muslims whom they accuse of supporting the militants. The brutal tactics they employ — including summary executions, "disappearances," torture and rape'— have provoked widespread alienation from India.

The Indian army has aggravated the situation by recruiting ex-servicemen, who for historical reasons are almost exclusively Hindu, to serve in Village Defence Committees (VDCs) that assist the army in military operations. In Doda and the border districts, where the population is nearly evenly divided between Hindus and Muslims, there is growing concern that tensions between the two communities might ignite a wider commonal conflict.

Although fighting has waned elsewhere in the Kashmir valley and the Indian government has claimed that "normalcy" has returned, abuses by the army, federal paramilitary forces and a newly constituted police force arc rife. Human rights defenders been killed. tortured and threatened, while detentions and "disappearances" have left residents fearful of speaking out.

Indian forces have also continued to arm counter militant militias to work with the army and other security forces, but without any official accountability. These militias have assassinated human rights activists and journalists and have threatened and assaulted other civilians.

Custodial killings — the summary execution of detainees—remain a central component of the Indian government's countennsurgency strategy. In this report, Haman Rights Watch documents nine that occurred in 1998 and one that occurred in 1997. The killings continue because senior Indian officials say there is no other way to counter a serious "terrorist" threat.

"Disappearances" of detainees also remain a serious problem. Not only has chetiractice continued, but there has been no accountability for hundreds of cases of "disappearances" that have taken place since 1990. Indian security forces also engage in brutal forms of torture which likewise have the sanction of senior officials. The latter privately jusufy the practice on the grounds that there is no other way to obtain information from a suspect. In fact, torture is also routinely used to punish-suspected militants and their supporters, and to extort money from their families.

Methods of torture include severe beatings with truncheons, rolling a heavy log on the legs, hanging the detainee upside down, and use of electric shocks. Indian security forces have raped women in Kashmir during search operations, particularly in remote areas outside of major cities and towns.

Prosecutions of security personnel responsible for abuses arc rare. The Suite Human Rights Commission's work is severely hampered by the fact that it cannot directly investigate abuses carried out by the army or other federal forces. Although government officials claim that disciplinary measures have been taken against some security personnel, criminal prosecutions do not take place.

Militant groups operating in the Kashmir valley have also targeted civilians, assassinating political leaders, civil servants and suspected informers. They have massacred Hindu families and threatened others in an attempt to drive Hindus from the region.

The report is based on a mission to Indian-controlled Kashmir *in* October 1998. India does not officially permit international human rights organizations to conduct investigations, the report is available at Human Rights Watch's web site:

http://www.hrw.org/reports/1999/kashmir/

Not An Inch Of Our Land But What About The People?

Rashme Sehgal

A huddle of 30 dishevelled children sits on the cold floor of an improvised classroom over looking the snow-capped mountains whose slopes dip sharply into the turbulent Sindh river. They have no textbooks, no pencils. But their teacher Ghulam Mohiuddin, from the village of Matayan in the Kargil district, holds classes every morning. The children repeat their multiplication tables in an attempt to pretend things are normal.

Mohiuddin, 52, looks on sternly. He does not hesitate to thump a child if he gels too frisky. "It would have been better if the local administration had provided these children with text books so that they do not lose a crucial year. But since they have not visited us even once to find out whether we are dead or alive or even bothered to give us essentials like rice and kerosene or money with which to buy them, expecting them to fork out school books is asking for the moon," he says.

The village of Matayan has 400 inhabitants. On the night of May 13, the Pakistani army started shelling this settlement. The terrified villagers, the majority of whom are Muslims, trekked down the Zoji Lapass, making their way down to the safety of the village of Kulan, located at 8000 feet.

"We left our homes in panic. We brought nothing, not even our warm clothes. We left behind our cooking utensils, our grains and our animals, certain that the government would help us till we could return home" says 50-year-old Noori.

"But we have become beggars in our own country," she laments. "We would have starved were it not for the kindness of the local villagers. They have fed us and allowed us to live in their homes. We are grateful for that." The people from her village nod in quiet agreement. They have yet to come to terms with such bureaucratic callousness.

"Most of the villagers who have migrated from Matayan are suffering from malnutrition, gastro-enteritis and scabies," says Dr Shabir, a medical officer with the Jammu and Kashmir state government working at a nearby dispensary. "Were it not for the locals, things would have been worse."

If Matayan is the first village that you encounter crossing the Zoji La pass, Pandrass, at 10,000 feet, is the second. The villagers from there, now living in the village of Gagan Gir, have an equally harrowing tale of state neglect.

The shelling of Pandrass began on May 6. The villagers hoped it would end quickly, and so initially refused to leave. The Indian army, unwilling to take chances with their safety, provided them with transportation up to Neelgral, from where it was a three-day march down to Gagan Gir. The journey was a nightmare. The nights were bitingly cold and this group of 200 doughty villagers — many with their children — were forced to sleep in the open.

Still they were better off than their brethren from Matayan. The J&K Power Development Board had a number of offices lying vacant in Gagan Gir and they were given permission to stay here. But Faiz Ahmed Kari, district project officer in Kargil, who was forced to leave his home and move here with his family, complains of the lack of other support.

"For 60 years, we have looked after the borders. In winter, the temperature here drops to minus 50 degrees Celsius. We live in mud housesnhat are completely sealed off for seven long winter months. We live with our cattle on the same floor for the warmth of their bodies. We stock up food like 'sattu' (roasted barley flour) and survive on salt lea with yak milk.

"Now we have come away, leaving our homes empty. Our animals are at the mercy of half-wild dogs. Surely the government owes us something. A few government functionaries have visited us but have extended no aid whatsoever. Shabir Shah is the only leader who has been to our camp and has given Rs 500 in cash to each family. Surely the government should realise that we need special assistance," Kari adds.

Wherever one goes, there is a smouldering anger at how a diligent and stoic people, unafraid of coping with extreme weather and negligible natural resources, have been given the short shrift by the state government.

Some compare their flight with that of the Kashmiri pandits in Jammu. Abdul Wahid, an agricultural officer in Kargil points out, "When the Kashmiri pandits left the valley, look at the hue and cry created in the press. Today every Kashmiri pandit family forced to leave is receiving Rs 2,500 per month from the government. In comparison, the only aid we have received is five kilos of rice per family and four kilos of kerosene. How far will that get us?"

Many of the villagers simply want to be allowed to go back to their homes to bring back essentials. "Surely the army should grant us permission to get some stock to help us survive," is a common refrain.

The Kargilis face an uncertain future. The farmers fear the loss of their animals. The children fear the loss of a year of their education. And together, they fear the winter that will set in, come September. Drass is the second coldest inhabited place in the world. Matayan and Pandrass are no less uninviting. They have learnt to fight the adversity of nature, but the indifference of the local government? That hurts.

The Tunes of India Review, July 4, 1999

A Way Out of Kashmir Quagmire

S. P. Udayakumar

> It will soon be minus fifty degrees celsius in the heights at Kargil, Even urinating is a - painful activity at such temperatures. Our soldiers no doubt deserve the best to cope with the conditions. But what about the people who live there year in and year out. Don't they too deserve our help? Are they not Indians?

There is no dearth of patriotic fervour, nationalistic rhetoric, strategic analysis, ami mindless moralising on Kashmir but one can hardly find any concrete proposals to get out of this quagmire that has sapped the resources, energies and vitality of both India and Pakistan.

Probable Solutions

There are a range of possible solutions:

1) Either of the countries having whole of Kashmir
2) Both not having it
3) Both having parts of it.
4) Both having the whole of it.

Neither India nor Pakistan would even think of letting the other have Kashmir completely. If one of them were to do that, we would not have this conflict at all.

The other option *of* both countries having parts of Kashmir has not worked. India has controlled two thirds of Kashmir as the state of Jammu and Kashmir, and Pakistan the remaining one third of it as Azad Kashmir (after acceding Shaksgam and a few other pockets of land to China which also controls Aksai Chin area). This unofficial division along the Line of Control' has always been considered by both India and Pakistan as some kind of an interim arrangement before they acquire complete control over the whole of Kashmir Kargi1 episode demonstrates all this amply well.

There are powerful groups who demand reunification of Kashmir and complete independence from both India and Pakistan. Can all the Kashmiris together form a viable country of their own? Both India and Pakistan are united in refusing to even consider this possibility.

It leaves us then with only one option both India and Pakistan having the **whole** of Kashmir One may wonder how on earth is it possible lor the two age old archenemies together to administer peace and justice to the Kashmiris? One may argue that religious antagonism, communal mistrust, social myths, historical traumas, and military wars arc not conducive to this arrangement But South Asians are in a situation where they need to choose between swimming together or sink ing together.

As the first step. both the Indian and Pakistani elites should come to grips with relity. Instead of concentrating on the strategic, political, historical and cartographic anti-eties from then viewpoints, the ehies should open up the arena for popular discussions

When the "ordinary citizens" of India and Pakistan begin to debate openly and freely that will free up our political creativity and enhance our ability to find an amicable settle ment for the issue

There are many ways for India and Pakistan to have the whole of Kashmir Joint administration of the reunified Kashmir of each country adminstering spcific departments in the reunified Kashmir's government, or divided administration that is area specific, period specific, duration specific and so forth

India. Pakistan, and Bangladesh would need to undertake a bold Constitutional reform program, give greater autonomy to all of then provinces and retain only some key areas such as defence, foreign affairs, currency matters, environmental policy and so forth for the led eral government in New Delhi, Islamabad and Dhaka. The most practical way would be India's and Pakistan's area specific administration of Jammu And Kashmir a*nd* Azad Kashmir that are coupled together in a broader framework. As Kashmiris of both Jammu and Kashmir and A/ad Kashmir manage their own affairs jointly under the new Constitutional reform programme, India and Pakistan tan hold on to the portions they have right now for administering defence, foreign affairs, and other federal responsibilities in close consultation with each other.

Make Kashmir the Subcontinent's Antarctica. The area that has kept us all divided and poor can be made into a stepping stone for a new beginning for friendship, dignity and development.

The 26 states and six union territories of India, the four provinces. Azad Kashmir, 'tribal areas' and federally administered areas of Pakistan, and the five divisions of Bangladesh can create a loose regional confederation of "Union of Subcontinental States" with economic co-operation, free travel, educational and cultural exchanges and other such confidence building and development enhancing measures.

All this may sound very idealistic or even naive. But then ending the cold war, abolishing apartheid, or bringing the Israeli Jews and Palestinians together all sounded naive and idealistic not too long ago.

The Hindu, July 01. 1999

"But friend I am just mad"
By reading hooks and piling up
knowledge,
I tortured my mind, gaining nothing
Never did I lighten the lamp of my
heart
Thus always chose the crooked path
Never shared the pain of the
oppressed
Only scatterred around words cheap
and meaningless
was mad all life through

Inayatullah

Breaking Out of the Suicide Pact

More than 500 enthusiastic peace-mongers gathered in Karachi recently — in the first conference of its kind in the region — to demand an end to the nuclearisation of the region and a no-war pact between India and Pakistan as a follow-up to the message of peace and goodwill generated by the meeting of the Prime Ministers of both countries in Lahore recently.

Organised by the Pakistan Peace Coalition (PPC), a national body formed following the Indian and Pakistani nuclear tests of May 1998, the two-day Pakistan Peace Conference had a distinctly South Asian flavour, with the attendance of some 30 Indian delegates who got Pakistani visas literally at the last minute. Participants included activists from Sri Lanka, Bangladesh and Nepal besides over 400 from all over Pakistan.

PPC comprises the various organisations working for social justice in different Pakistani cities. Its members are basically activists who found their agendas overtaken by the nuclear issue following the May 1998 tests. Delegates to the conference, besides NGO representatives, included economists, film-makers, journalists, lawyers, doctors, trade unionists, women's rights activists, scholars, retired army personnel, students and artists.

There is a symbolic significance in choosing Karachi as the venue, said conference convener B M Kutty, pointing out that this city has been in the news as a violence-prone area. This conference sends out the message that this city and its people ardently desire peace, not only for themselves, but also for all those who live in this country and in the region. Peace in this city is essential to the emergence of a meaningful peace movement in Pakistan.

Until May 1998, all those working for peace and justice presumed a continuity of state and society, commented Zia Mian, a Pakistagi physicist currently teaching at Princeton University, USA. Nuclear weapons threaten that continuation as nothing else has ever done.

Also from the USA was journalist and researcher Lawrence Lifshultz, who co-edited a book published last year — Hiroshima's Shadow, an anthology that explodes the 'myth of Hiroshima' — popular beliefs that justify the USA's nuclear bombings of Hiroshima and Nagasaki in August 1945. 'The gathering here has interrupted my pessimism,' commented Lifshultz, who is currently working on another publication on nuclearisation.

What's very encouraging is that the demands of the Pakistan-India People's Forum for Beace and Democracy, considered Utopian just a year ago, have infiltrated the official agenda — people-to- people contact, reducing tensions and negotiating through dialogue. So what's happened at this conference could also influence what happens at policy or state level.

Talking about the principal tool the state has employed to subdue civil society — the bogey of national security — PPC organising committee member and Director of the Human Rights Commission of Pakistan. 1 A Rehman, in his keynote address commented that the nuclear tests had delivered a most foul blow to people's interests by raising the spectre of their extinction.

Perhaps it was this spectre that galvanised the spirit of voluntcerism so evident at the conference, to attend which most Pakistani and overseas participants had paid for their own travel — with the organisers only taking care of room and board in addition to the registration fee of PKR200.

The spirit of cooperation was also very evident in the response to Bombay-based film-maker Anand Patwardhan's announcement of the peace march due to start from Pokharan on 11 May, the anniversary of the first Indian nuclear test last year. Hundreds of participants signed the petition he circulated, along with donating at least one rupee each to contribute towards the march, totalling over R l.000 by the time the conference ended.

Many justify the nuclear tests of last May by saying that a balance of terror has been created and therefore the danger of war between India and Pakistan has disappeared. A view that IA Rehman is not prepared to give credence to because ' I am not prepared to credit the apparatuses governing us with the ability to break out of the suicide pact they have painstakingly created.'

Besides the element of human error, he noted, was the point that nuclear weapons have nowhere created a balance in favour of sanity — they have only unleashed a mad race for deadlier weapons for mass destruction. Above all. they do not cause havoc only when they arc used in war; their presence in a country itself causes grave harm to the state and the civil society.

Nine working groups, ranging from 25 to 60 participants each, deliberated various questions from the nuclear issue perspective. The idea, rather than announcing a charter of demands, was to spell out what society wants and to give a direction to the struggle to achieve it, explained conference organisers, who are hoping that participants would return to their areas armed with a better understanding of what peace means in today's conditions, and how best to politically mobilise people around a peace agenda. This conference is a rare opportunity for activists to get together, commented scholar Hasan Gardezi, who, like many, is wondering if the peace movement in Pakistan can become an agent of social change.

Islamabad-based political activist and development economist Kaiser Bengali agreed. "There is a need to link movements like this in the larger effort Isolated, standalone efforts don't bear fruit,' he said, as charged participants did a symbolic round of the conference venue on the last night, singing songs, and holding aloft flaming torches and white flags.

'We need to make it pan of a larger political effort to restructure the state, otherwise it will just be part of what I call Pepsi politics —there's a bit of fizz and then everything settles down. This mustn't be allowed to fall by the wayside like previous efforts.'

Beena Sarwar

The Role Model

In May, India and Pakistan celebrated their first anniversaries as declared nuclear weapon stales. On June 11, the United States will continue to celebrate 54 years as a nuclear weapon state by dedicating a facility that will be used to conduct more nuclear explosions. This celebration will be by deducating to the nation a facility known as "National Ignition Facility" (NIF) at the Lawrence Livermore National Laboratory (LLNL) in northern California.

The National Ignition Facility's goals include achieving contained thermonuclear explosions and maintaining the US's nuclear weapons capabilities. *The* NIF clearly violates the Comprehensive Test Ban Treaty, which commits the United States 'not to carry out any nuclear weapon test explosion or any other nuclear explosion.'And, since the achievement of a Comprehensive Test Ban Treaty was an explicit decision made in connection with the 1995 extension of the Nuclear Non-proliferation Treaty, any activity which violates the Test Ban also violates the Non-proliferation Treaty "

LLNL, managed for DOI- by the University of California, is one of the nation's two premier nuclear weapons research and development institutions. The National Ignition Facility (NIF), a stadium-sized inertial confinement fusion project now under construction at LLNL would be the world's largest laser facility, It is the centre-piece of the $45 billion (10 year price-lag) "Stockpile Stewardship" program to maintain and enhance U.S. nuclear weapons design capabilities under the Comprehensive Test Ban Treaty (CTBT) signed by President Clinton in September 1996. The NIF would operate by focussing 192 powerful laser beams onto a pea-sized capsule of radioactive tritium and deuterium, forcing the two heavy isotopes of hydrogen to combine through compression, and causing a momentary thermonuclear explosion that will crate extremely high temperatures approaching those reached in full scale underground nuclear tests. If this works — controversy still exists within the scientific community, "ignition" will be achieved, producing a seltsustaining fusion reaction and resulting energy gain.

In May. in a massive display of nuclear nationalism, the government of Pakistan ordered 10 days of celebrations to mark the anniversary of its first nuclear tests. May 28. 1998 The Ministry of Sports and Culture arranged special events across the country and the National Council of the Arts organised a national an competition to commemorate the tests. May 28. the day of the anniversary was a national holiday. It began with a 21 gun salute, followed by special prayers of thanks at the mosques, and a minute of silence followed by the national anthem at the precise moment Pakistan detonated its nuclear tests. The prime minister addressed a public rally at the mausoleum of the founder of Pakistan, and later-presided at an award ceremony to honour Pakistans nuclear weapons scientists India commemorated the anniversary of its own nuclear tests in a more understated manner, focussing on the purported benefits of science and technology.

'The only thing that separates the United Slates from Pakistan is 54 years of nuclear explosions and the enormous wealth of the most powerful country on earth," noted Jackie Cabasso. India, which really became a nuclear power in the l970's. in part through its own mertial confinement fusion program, demonstrates its longer experience in the quality of its propaganda, which more closely resembles that of the U.S." She explained, This NIF 'dedication' ceremony is nothing but a trumped up public relations gimmick to divert attention from our real national security concerns — security of people in their daily lives. The major threat to global peace and security is the United Slates' continuing drive for global domination through displays of massive high-tech military force backed up by the threatened use of nuclear weapons, as we've just seen *in* Yugoslavia. The NIF is part. and parcel of that system "

The French Atomic Energy Commission Department of Military Applications, which has worked with LLNL since 1981 on co-operative laser fusion programs is currently collaborating with Livermore to build the

Megajoule laser facility, virtually identical to the NIF, in Bordeaux, France. On June 4,1996, U.S. and French officials signed a memorandum of agreement extending the range of nuclear weapon information they can share. A section on Stockpile Stewardship authorises co-operation on "theoretical, numerical, and experimental simulation methods." Another section permits information exchanges on research, development, testing, fabrication, transportation, and disassembly of both nuclear and explosive components. U.S. and French scientists will also have extensive access to each other's laboratories. The agreement provides for co-operative use of, and "long term visits or assignments or technical personnel to participate in joint projects."

U.S. and British weapons labs also have for many years enjoyed a close relationship, even sharing underground testing facilities in Nevada. Their joint working groups discuss nuclear warhead physics, nuclear weapons engineering, nuclear weapon code development, computational technology, and other related subjects. In 1997 it was reported that the UK Ministry of Defence was actively talking with the U.S. and France about above ground experiments and computer simulation. It was also reported that technical discussions between Britain and France on hydrodynamic experiments, laser plasma physics, computer simulation, and possible arrangements for peer review, were taking place. At the 1995 Anglo-French summit, a joint statement was issued, noting, "the considerable convergence between our two countries on nuclear doctrine and policy."

According to Sally Light, "Given the sensitivity around the current allegations of foreign espionage, it is astonishing that the DOB is advertising its close co-operation with France and Britain. Who decides which countries are the good guys and which are the bad guys? The only country that's ever used nuclear weapons?"

In February of this year, a letter was presented to the Regents of the University of California urging the University to declare a moratorium on construction of the NIF at LLNL. The letter, which was signed by 116 organisations and individuals, including academics and scientists, advised the Regents that contained thermonuclear explosions to be conducted in the NIF "may be considered illegal under the CTBT," which prohibits "any nuclear weapon test explosion or any other nuclear explosion," The CTBT also requires parties to "prevent" nuclear explosions in their jurisdictions. The letter concludes, "the Regents should take whatever action is necessary for the Laboratory to suspend work on the NIF project until the legal questions are resolved...The Regents could also use the time during the work suspension to conduct a university-wide debate on the appropriateness of one of the world's greatest universities continuing with nuclear weapons research. This should be a matter of far wider debate within the academic community and the country as a whole. We urge that you use the occasion of the NIF review to initiate that debate."

In a related effort, Ms. Light, with the input of American and French colleagues, has drafted an international petition, available in both English and French, calling on the U.S. and France to respect their commitments to the CTBT and the NPT by immediately halting NIF and Megajoule construction and declaring an end to all such projects.

Sally Light summed up, "The U.S. National Ignition Facility and the French Megajoule laser not only violate the CTBT, they also threaten the current interntional ratification process of the CTBT, and jeopardise nuclear non-proliferation efforts by encouraging other countries to undertake similar programs." Jackie Cabasso added, "In short, N.I.F. means Nuclear Insanity Forever."

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Nuclear-Free

World

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Rs. 36/ - per year (6 issues) only within India
Single Copy: Rs 8/- only
U.S. $ 15/ - per year or equivalent in other currencies for airmail overseas
Rs. 360/ for life (only within India)

Subscriptions articles, general chit-chat should be addressed to:
Editor Anumukti
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Demand drafts should be Made in the name of "Editor Anumukti" and drawn on the State Bank of India, Valod (Code: 0531)
For cheques and drafts drawn on other banks, please add Rs 10/- collection charges

Anumukti Team: Hansa, Daksha, Ranjit, Prashant, Philips, Kalpesh, Sanghamitra and Surendra

Published by
S.Gadekar for Sampoorna Kranti Vidyalaya
Publication Date: July 31, 1998

Printed at:
Ashish Offset, Sankeshwar Complex, Surat

* * * Printed Books * * *
(Clause 121/1 of P &T Guide

ANUMUKTI
A Journal Devoted to Non-Nuclear India

Volume 12 November 4 September 6, 2000

Kudankursk

Their sub sinks in the Barents Sea;
clueless ami helpless, they keep wrenching their hands.
Their sailors the drowning together in the iron cage,
And the Nero-put in plays his fiddle in the Black Sea resort!

Defying nukes, leaks, decimation and death,
Norwegians offer hely but they aren't loo eager.
Their ostankino glory burns earthward for 26 hours;
They're looking up to the Heavens for miracles!

Stale of the state worries bureaucrats,
slide in infrastructure bothers technocrats,
Spate of events shatter the politicos and
State of the coffers makes them all panic.

The "pitiful helpless giant," as their leader calls it,
thought in gargantuan terms but is fast crumbling down,
seeds money, jobs, foreign projects and guinea pigs
To instil life into economy and stay afloat on the world may.

here they are on our shores, on the My of Bengal,
parading discredited technologies and doubled know-hows
And playing with our lives and futures for their survival,
why does Koodankulam sound now as Koodan-kursk?

S. P. Udayakumar

Events Diary

August 6. 2000

Jaduguda: About 1500 local children had made hundreds of paper cranes in memory of all the children who had perished in the nuclear holocaust at Hiroshima. More than 50 children suffering from different forms of deformity and mental retardation took part in a painting workshop. The programme culminated in a procession where the Uranium Corporation was asked to stop its pollution. We have received reports of large number of programmes in various schools in Nagpur in which more than ten thousand children have participated.

August 9, 2000

Calcutta: Police beat up demonstrators protesting against a state government decision to build a nuclear power plant in West Bengal. More than 100 organisations had participated in organising the peaceful demonstration which was attacked without any provocation. 41 people were arrested and even women were illegally manhandled by male police.

May 15-26,2000

Pokran: Anumukti team in collaboration with Swaraj Trust of Rajasthan completed the data collection for a comparative health survey of five villages in Jaisalmer and Jodhpur districts. Analysis of this data is proceeding.

Coming Events

11-13 November 2000

Delhi: National Convention for Nuclear Disarmament and Peace is being held in Delhi from 11 to 13 November 2000. All antinuclear energy activist should participate to draw attention to the close connection between the Atoms for War and the Atoms for Peace programmes. Unfortunately this connection is not apparent to many peace activist.

11—30 September 2000

Jaduguda: Anumukti team in collaboration with JOAR will conduct a comparative health survey of villages in the vicinity of the uranium mines at Jaduguda.

From

A Cautionary Tale

As work continues on a "feasibility study" for construction of two Russian VVER-1000 light water reactors at Koodankulum, Indians would do well to review Russians' sad experience with the atom. Many things are still unknown about the Soviet nuclear program. Debates continue among experts as to the number of tons of plutonium (and therefore also the volume of reprocessing wastes) that have been produced. Little is known about early waste dumping practices. Information on the health of workers and neighbors of nuclear plants is even more difficult to obtain and evaluate. Yet, the overall picture is clear. From nuclear submarines decaying in northern and eastern ports, to the Semipalatinsk test site in the south, in present-day Kazakstan, the race to produce nuclear weapons has resulted in environmental contamination on an enormous scale, with site-by-site contamination measured in millions and billions of curies. In addition, even a full decade before Chernobyl, the Soviet people had already experienced a reactor accident that must rank among the world's most serious (SEE P. 5).

The Soviet nuclear establishment acted little differently from that of any other country in terms of their disregard for the human consequences of their activities. But the scale of their production, combined with the complete lack of public oversight, put the resulting damage in a class of its own.

Russia provides a cautionary example to Indians for another reason as well. If nuclear energy is dangerous in a wealthy country, it can be disastrous in a poor one As former nuclear regulator Vladimir Kuznetsov (P. 4) reminds us, when money is tight, safety and environmental provisions are the first to go.

There have been widespread movements in Russia to bring an end to nuclear production, and to draw attention to the suffering brought about by the carelessness of the nuclear establishment, from referenda blocking new reactor construction, to independent monitoring efforts. But, as articles on page 7 demonstrate, the task of these activists is getting increasingly difficult and dangerous, as environmental concerns take a backseat to the desire for quick profit. Nowhere is this callous equation clearer than in the Ministry of Atomic Energy's (Minatom) invitations to foreign countries to export their nuclear waste in Russia, with the resulting revenue to be used for new reactors (with the subsequent production of even more waste). With the drying up of its traditional government sources of funding, Minatom has turned its gaze abroad. A project to convert surplus weapons plutonium into reactor fuel (with financial support from the US and the G-8 countries), and export of reactors and other technology are two additional potential funding sources for Minatom's ambitious construction plans. Unfortunately, Minatom's willingness to clean up existing sites does not match its zeal for new projects.

Thus Indians have an additional, neighborly reason to oppose the reactors at Koodankulum. They will not only be safeguarding their own future, but by denying funds to an irresponsible Russian nuclear establishment, will also be lending a hand to the many Russians who are trying to put an end to their country's nuclear nightmare.

—Anita Seth

Russia Is an Eco-Disaster, and It Just Got Worse

A couple of months ago, Russian President Vladimir Putin abolished his country's environmental protection agency—a decision that bodes ill not only for the people and ecosystems of one of the world's most polluted nations, but also for the security and environmental health of the entire world.

Acting by decree and without explanation, Putin shut down the State Committee for Environmental Protection on May 17 and transferred its responsibilities to the Natural Resources Agency, the government body that licenses the development of Russia's vast stores of petroleum and minerals.

After eliminating the State Committee on Forestry, Putin completed his governmental reorganization by naming Alexander Gavrin, who has close ties to the country's biggest oil producer, Lukoil, as energy minister. In short, Putin has put industrial foxes in charge of the environmental henhouse.

Created as a cabinet-level body under Mikhail Gorbachev in 1991, the Ministry of the Environment was downgraded to a mere State Committee in 1996 by the newly reelected Boris Yeltsin. But many Russian environmentalists point out that the committee played a positive role in some cases—it helped the Russian environmental law firm Ecojuris stop Exxon from dumping toxic waste from oil drilling into the seas off the Sakhalin peninsula, for example. Despite their frequent criticisms of the committee's inadequacies, alarmed activists are now gathering signatures to force a national referendum on Putin's decree. "Even a shabby State Committee for the Environment is better than no environmental monitoring body whatsoever," argues Greenpeace Russia spokesman Alexander Shuvalov.

Victor Danilov-Danilyan, who headed the committee when it was abolished, notes that 61 million Russians already live under environmentally dangerous conditions. In 120 Russian cities, air pollution levels are five times higher than acceptable, according to Russia's own standards. One million tons of oil the equivalent of 25 Exxon Valdez spills—leak out of pipelines and into Russia's soil and water every month. The Russian news agency Tass reports that 30 percent of Chechnya is an ecological disaster zone, thanks in part to the 26 oil wells that have been on fire nonstop for months.

Nevertheless, one day after Putin's announcement, the Natural Resources Agency declared it planned to "simplify" rules governing environmental behavior in Russia. Logging policy in particular is slated for overhaul. Russia contains 22 percent of the world's forests more than any other nation. With help from a $60 million loan from the World Bank, the Putin government plans to improve the investment climate for logging in Russia. Leveling Russia's vast forests will speed the extinction of countless plant and animal species, it will also remove a major source of fresh air and water and a counter to global warming.

Nowhere are Putin's actions more frightening, though, than with respect to nuclear technology. The State Committee for Environmental Protection did not directly oversee Russia's nuclear industrial complex, but Putin's business-first attitude seems certain to carry *over* to nuclear policy. Not one of Russia's 29 nuclear power plants has a complete safety certificate; many have been cited for hundreds of violations. Yet Putin's minister for atomic energy, Yevgeny Adamov, wants to build 23 more nuclear power plants, plus another 40 advanced, "fast breeder" reactors.

Adamov says fast breeder reactors will make Russia rich, which is the same reason he offers for changing Russia's laws to allow the import of tons of nuclear waste- as if Russia isn't already choking on the stuff.

During the Cold War, the barbors of the Kola Peninsula (in northwestern Russia near the border with Norway) were home to the Soviet Union's Northern Meet, which dumped used submarine reactors, spent fuel and other nuclear debris into the sea with abandon. The waters now contain two-thirds of all the nuclear waste dumped into the world's oceans.

The problems at Kola came to light through the work of Alexander Nikitin. who was arrested by federal security services (FSB) in 1996 on charges of treason and divulging state secrets (SI I P. XX) Putin, who headed the ESB in 1998 and 1999, defended the FSB's aggressive stance toward Nikitin and other environmentalists, asserting last year that environmental groups provide convenient cover for foreign spies But Putins May 17 decree suggests that his real concern is not that environmentalists will compromise state security, but that their efforts will elevate ecological purity over the speedy resource development that the Russian leader believes his country needs

Mark Hertsgaard
The Washington Post, July 9. 2000

Mark Hertsgaard is the author of "Earth Odyssey: Around the World in Search of Our Environmental Future" (Broadway Books).

The Whistleblower Is Whistling, But Are We listening!

Safety Problems in the Russian Nuclear Complex

V. M. Kuznetsov

V.M.Kuznetsov is a Russian nuclear industry insider. He has worked in nuclear power plants as well as in Gosatomnadzor the Russian nuclear regulatory agency. What he has written is written with an expectation that the Russian nuclear industry would overcome its myriad problems. We in India need to seriously consider all these problems before committing ourselves to this nuclear technology at Koodankulam.

The number of incidents at nuclear facilities in Russia continues to increase, due in part to gross violations of nuclear and radiation safety regulations (unskilled handling and losses of ionizing radiation sources, unplanned doses to workers and the surrounding community, etc.). These incidents occur because of inadequate worker training, the irresponsible attitude of managers and specialists, and the overall poor culture of safety among workers at nuclear plants and among the population.

The situation is compounded by the poor quality and significant degradation of

- equipment, and planning mistakes made during the construction of plants posing nuclear and radiation hazards.
- Long-term use of atomic energy for peaceful and military purposes without legal regulation has also contributed to the situation, giving rise to many problems demanding urgent solutions (plant decommissioning, overhaul of operating facilities, long-term storage of radioactive wastes, etc.).

In addition numerous violations at nuclear power plants (NPPs) and other Minatom facilities, a number of serious accidents, accompanied by releases of radioactive materials into the environment, have occurred, including those at the reprocessing plants at Tomsk-7 (1993) and at Chelyabinsk-65 (1994, 1995).

Decision-making in earlier periods failed to guarantee safety in nuclear materials use, and to some extent in spent fuel reprocessing and long-term storage, which now require large financial and material resources.

> When Money Becomes Tight, Safety Is The First Casualty

The country's current economic situation (the slump in production, breakdown in production networks, increasing production expenses, difficult finance situation facing most operations, especially governmental) has led to the development of additional factors affecting the condition of nuclear and radiation safety, such as:

- loss of leading highly-qualified professionals, who have been replaced by a pool of incompetent specialists;
- a reduction in staff overseeing facility safety, including offices that carry out nuclear and radiation safety controls;
- insufficiency, and in most cases total absence of funding for replacement of outdated or nearly expired equipment and instruments that are important to guaranteeing safety
- sharp increase in the cost to facilities of labor and services for maintenance of nuclear and radiation safety, including for transport and storage of radioactive waste, and disposal of contaminated uniforms
- the weakening role or liquidation of ministerial control over facility safety
- the absence of a strong, meaningful independent governmental regulatory body in Russia.

From: Russian Atomic Energy Yesterday, Today and Tomorrow (Moscow: Golos-Press, 2000).

History of VVER-1000 reactors

Balakovo Nuclear Power Plant

The Balakovo NPP is located on the banks of the Volga River, 160 km up from the city of Saratov. Originally, Balakovo was planned to be the biggest nuclear power station with proposed construction of 24 reactors along the Volga. However, after the Chernobyl accident and numerous protests by the "greens," the number of proposed reactors was reduced to six.

Construction on the plant began in 1980. Today there are four VVER-1000 reactors operating there. The first started operating in 1985, the second in 1987, the third in 1988, and the fourth in 1993. The third and fourth reactors have been operating under restricted capacity of up to 90% since 1993.

On July 31 1992 the Malyi Soviet (lower house) of the Saratov regional parliament adopted a decision regarding further construction and operation of the Balakovo NPP which, in part, supported a resolution by the Balakovo city council prohibiting the fuel loading and start-up of the fourth reactor. In addition, a decision was made to appeal to the upper house of the federal parliament to take a decision to remove construction of the second set of reactors at Balakovo from its energy development plan.

On 25 April 1993, a referendum was held in Balakovo on the construction of the fifth and sixth reactors at the NPP. 73% of voters opposed the construction.

In late February 1993, fuel loading began without notification of local authorities or the public, in mid-March, fuel loading was completed and the reactor began operation. However, soon the production of the reactor was reduced to 50% due to a lack of electricity demand.

The history of the start-up of the fourth reactor is notable also in that the current head of Gosatomnadzor [the Russian atomic regulatory agency] Yuri Vishnevskij was the head of Gosatomnadzor inspections at the Balakovo plant until 1991. (Balakovo at that time held the leading place among Russian nuclear power plants in incidents.)

In campaign speeches, Vishnevskii promised that if he was elected as a deputy to the upper house of the federal parliament, he would not allow the start-up of the fourth reactor, nor the construction of the fifth and sixth reactors at Balakovo. But times change, and in taking leadership positions, people themselves change. With the break-up of the Soviet Union, he moved from his deputy's chair into that of the head of the country's regulatory agency, and of course forgot everything that he had promised to his constituents.

Construction on the fifth reactor was begun in 1987, and the sixth in 1988. Recently Rosenergoatom [the Russian utility that operates NPPs] has evinced an interest in completing and starting up the fifth reactor.

The most pressing operating questions for all VVER-1000 reactors are: maintaining the required level of integrity of the reactor vessel, increasing the effectiveness of control, instrumentation, and electricity-production systems, increasing reliability of steam generators, and reliability of diagnostic systems.

But there is an additional set of problems specific to this particular power plant.

First, there is a danger of flooding in the case of a breach in the Samarskaya dam, which is located upstream on the Volga.

Second, construction irregularities were tolerated when the reactor foundation was laid. Settling occurred more quickly, and unevenly, than was projected,resulting in construction difficulties, especially for the first reactor. A "counterweight'*-a concrete beam stretching from one side of the roof to the other— was built, in order to "guarantee absolute horizontality of the main reactor vessel and its associated equipment." The plant administration, which initiated this method, called it a "technological novelty."

Below are some of the most serious incidents that have occurred at the Balakovo plant:

- During tests of the first reactor in 1985, before it was loaded with fuel, a pipeline break caused by worker negligence killed thirteen people. The person who allowed the accident to occur, after one year of confinement, became a personnel instructor at the Smolensk training center
- A massive shutdown of the steam generators occurred from 1987 to 1991
- In the first quarter of 1997, damage to the steam generator in the second

Leningrad accident

The Chernobyl accident, because of its borrifying magnitude, has overshadowed other serious accidents that occurred in Soviet reactors, such as this 1975 Leningrad accident, virtually unknown outside of Russia. The accident followed two serious incidents at the plant in January and February 1974.Four RBMK reactors are in operation at the Leningrad nuclear power plant, the first dating to 1970

On 30 November 1975. an accident occurred at the first reactor of the Leningrad nuclear power plant, which involved a large release of radioactive materials. The accident was caused by a fuel rod that split open in one of the 1693 channels leading to partial destruction of the reactor's active zone. 1.5 million curies of radioactivity were released into the environment. Immediately after the accident, the background level of radiation
er of Sosnovy Bor [the suburb of
where the nuclear power plant is
eached 8 roentgen. Residents of
or and the surrounding areas were
ed of the accident. The first
f it occurred in March 1976 at the
f foreign Affairs, when Prime
Kosygin mentioned inquiries by
and Finnish governments
increases in background radiation
in their countries

reactor caused localized contamination of 30 m^2 of the ceiling of the machine room which exceeded the regulatory limit (up to 180 microR/h).

- On June 26, 1993, eleven control rods in the second reactor became jammed during a safety test that was conducted during a repair stoppage. The reactor was on "hot" standby before repairs were to begin. The temperature of the primary cooling circuit was 280 degrees C, the pressure 160 kg/cm^2. While the safety test was being performed, eleven control rods got stuck in an intermediate position in the lower zone. The incident corresponded to Level 2 on the INES scale.

Other operating VVER-1000 reactors in Russia

Two VVER-1000 reactors are operating at the Kalinin NPP, located near the town of Udomlya, [north of Moscow). The first reactor began operating in 1984, and the second in 1986. A third reactor of the same type is under construction, with start-up planned afer 2002. Construction of a fourth reactor was stopped at the end of 1992, following a governmental decree.

Among the most serious incidents that have occurred at the plant are:

- On 1 July 1992, localized radioactive contamination of the ground adjoining the first reactor at the plant was discovered when a pit was dug in preparation for enlargement of the building.
- In 1994, two workers received doses exceeding the allowable limit (5 rem) and two others exceeded the regulatory limit (3 rem) while doing repair work.

Source: Vladimir Kuznetsov, Russian Atomic Energy: Yesterday. Today and Tomorrow (Moscow: Golos-Press, 2000),

● Leaked Documents Show Russian Nuclear Safety Shaky...

Confidential governmental documents, released by Russian environmental organizations Eco Defense! and the anti-nuclear campaign of the Socio-Ecological Union in May, show that the level of safety at nuclear power plants is dangerously low in Russia.

The first, a report by the Ministry of Atomic Power (Minatom) dated March 31, 2000, was prepared for a meeting in the closed city of Snezhinsk attended by President Vladimir Putin. The second is a report from the Nuclear Inspectorate (GAN) on nuclear and radiation safety in Russia in 1999, According to both documents, there were 840 cases of violation of nuclear safety norms and rules at Russian nuclear power plants in 1999.

For longtime, Russian nuclear plants were serving both military and civil purposes without special legislation. Presently the equipment at Russia's nuclear power reactors is too old to operate normally, and their design is outdated, warns Vladimir Slivyak, antinuclear campaigner for Eco Defense! and the Socio-Ecological Union. "Nuclear reactors of the first and second generations must be shut down according to adopted safety rules in Russia, but there is no technical experience and nor finances to do that," says Slivyak.

Moreover construction of Soviet designed reactors continues - an RRMK graphite-moderated reactor at Kursk and two VVER-1000s light water reactors at Kalinin and Rostov

...Yet Minatom Unveils Plans to Build 23 Additional Reactors and Import Nuclear Waste

Russia's Minister for Atomic Power, Dr. Evgeny Adamov announced on May 25 plans to build 23 new nuclear reactors by 2020 and to change Russian law to allow the import of nuclear waste, Russia currently operates 29 nuclear power plants.

These plans are a part of the Ministry of Atomic Energy's (Minatom) new program of nuclear development for the next 50 years, presented to the government of President Vladimir Putin. The text of Adamov's speech, obtained by environmental groups, proposes decreasing consumption of natural gas and increasing nuclear power generation to replace natural gas.

In his speech, Adamov's argument is that Russia will run out of natural uranium in 60 years unless government agrees to his proposed strategy.

Investment needed for implementing of this strategy is US$32 billion. According to the text of Adamov's speech, expenses will be covered by increasing prices for electricity and import of nuclear waste from all over the world to Russia, requiring a change in Russian environmental law. This is not the Russian government's first look at changing the law governing import of nuclear waste. In February and September 1999, the State Duma (Parliament) considered measures favoring spent fuel imports.

The amount of spent nuclear fuel accumulated in Russia is currently about 14,000 tons. Minatom's new strategy allocates only about US$3.6 billion over 30 years for nuclear waste management.

—Environmental New Service, May 2000

The Post Soviet "Democratic" State

Abuses against anti-nuclar activists in Russia

On July 2, 1999, Aleksandr Nikitin, a former Soviet submarine captain, was charged for the eighth time with espionage for blowing the whistle on illegal nuclear waste dumping. Although he had already been acquitted several times already on the same charges, Russia's FSB (previously the KGB) continued to press the case against the former Naval officer, relying *on* secret decrees given retroactive force.

in "The Russian Northern Fleet: Sources of Radioactive Contamination." a report he co-authored with the Norwegian Bellona Foundation, Nikitin helped document the problems of radioactive pollution from mothballed nuclear submarines. "Without international cooperation and financing," the report warns, "a grave situation could arise which can be pictured as a Chernobyl in slow notion If safety measures are not implemented, major accidents and the release of fissile material will be unavoidable."

Because he wrote two chapters in the report - a report that contained information easily garnered from public sources - Nikitin was persistently harassed. His home and office were bugged, his car was routinely followed and vandalized, and his lawyers were harassed by the Russian secret police. His trial began in late November. Nikitin was acquitted of high treason on December 29, in part thanks to Russian and international human rights and environmental activists who had been working on his behalf. The judge ruled that there was no legal basis for the FSB's charges and criticized the manner in which the investigations had been carried out. The Federal Security Bureau has the right to appeal the ruling to Russia's high court.

Pattern of Persecation

Aleksandr Nikitin's case is not an isolated incident, but only the most well-known example of a larger trend of harassment of environmental activists in Russia

Military weapons, radioactive pollution being a byproduct, remain one of Russia's few major exports. Neither the military, nor its client industries want environmentalists peeking into the dark corners. Despite constitutional provisions that recognize the right to a favorable environment, the right to reliable information about its condition, and compensation for damage to health or property caused by ecological violations, the Russian government actively stifles the freedom of expression for environmental activists working on Russian nuclear and toxic contamination

Navy captain Grigory Pasko, was arrested and convicted for his efforts to expose nuclear waste dumping and radioactive pollution problems caused by Russia's decaying nuclear submarines in the Russian Far Eastern Fleet. Although he was later released, the military journalist was found guilty of abuse of office for personal gain and violating the interests of society and the state.

According to reports published in the Ottawa Citizen and the St. Petersburg Times in July 1999. The FSB raided the laboratory of scientist Vladimir Soifer. ending his scientific research into contamination of the Pacific Ocean by radioactive waste.

On September 6, 1999, Socio-Ecological Union and Eco-Defense! anti-nuclear campaigner Vladimir Slivyak was arrested near his Moscow home by the city's criminal police. Slivyak was accused of being a terrorist [specifically, taking part in the bombings of several Moscow apartments, which were also widely reported in the media as the work of Chechen separatists). The police waived a bag of marijuana in front of his face and threatened him with additional drug charges unless he cooperated In December, EcoDefense' campaigner Alisa Nikulina was summoned to the ESB headquarters at Lubyanka and questioned for several hours as a "witness" to the apartment bombings

In the fall of 1999. three members of the Chelyabinsk-based Movement for Nuclear Safety (MNS) were arrested after a demonstration highlighting the degredation of the Techa River, which has been severely contaminated by the operation *of* the "Mayak" plutonium production plant Earlier this year, the governmental Committee for the Environment brought a lawsuit against MNS and a local newspaper for libel The defendants were exonerated in court

In the fall of 1999. the ESB confiscated a computer and research materials from Joshua Handler, a PhD candidate at Princeton University and former Greenpeace campaigner. Handler is writing his dissertation on strategic nuclear weapons

Igor Sutyagin, a researcher at the Russian Institute for US and Canadian Studies with whom Handler was working. was arrested in October 1999 Sutyagin has published on military and arms control issues, and was involved in a project examining civilian-military relations and the role of the military in Russian society He is currently in a security services prison awaiting trial, and has been denied visits for the past four months His initial six-month jail term was extended by three months *(in* violation of Russian law) on the grounds that inquiry into his case had not been completed. The FSB has not yet Tiled formal charges against Sutyagin. but has announced that it will accuse him of espionage and treason. He is facing a potential sentence of 12-20 years.

In 1998, the Russian Federal Justice Department enacted a decree that allows state authorities to deny official registration of many human rights and environmental groups. In August 1999, the Moscow City Court upheld a lower court's ruling to deny official registration for the Moscow-based Advocacy Coalition for Environment and Human Rights led by Alexei Yablokov, a former environmental advisor to President Yeltsin and leader of Russia's environmental movement. A Russian Justice Department official claimed that "the protection of human rights in the state is the responsibility of the state itself."

In early 1999, the same department refused registration to seven other Moscow-based human rights groups, including the Glasnost Foundation, on the same grounds. In February 2000, the police ordered that the Moscow office of Greenpeace International be sealed off because of failure to get official permission for a recent renovation, but retreated when asked to produce an official order.

In spring 2000, regional prosecuters conducted audits of a number of environmental organizations, including Chelyabinsk-based "Techa," which addresses radioactive contamination resulting from operation of the Mayak nuclear plant, St. Petersburg-based "Green World," which monitors the Leningrad nuclear power plant and recently campaigned against construction of a nearby oil terminal, and Sakhalin Ecology Watch.

"Our freedom of speech is already much smaller than in the early '90s," says human rights advocate and attorney Yuri Schmidt. "It will become worse. If you don't act now, tomorrow we will wake up in the USSR."

Based on
Amnesty International Report

Unintended Consequences
The Moscow Plutonium Deal

At their summit in Moscow in June, U.S. President Bill Clinton and Russian President Vladimir Putin initialed a landmark deal: The United States and Russia pledged to destroy 34 metric tons of weapons-grade plutonium, largely by using it for fuel in civilian nuclear reactors. The agreement suggests a showcase of cooperation between the two nations, eliminating fuel that could be used in weapons of mass destruction.

But over the long term, this agreement may, in fact, worsen the problem of nuclear proliferation. The Clinton-Putin agreement will create a large-scale global civilian demand for and supply of plutonium, a prime component in the construction of nuclear weapons.

According to the text of the agreement, Russia will turn its share of the plutonium into a fuel called MOX, for use in nuclear reactors both in Russia and abroad. The United States is adopting a similar plan for 25.5 metric tons of its plutonium; the remainder will be sealed in glass and buried. The United States will pay for its portion, $4 billion, by itself, as well as sink $200 million into Russia's civilian nuclear industry. At the July summit in Okinawa, the United States and Russia will ask the G7 to cough up the remaining $1.55 billion for the Russian program .

Much of the MOX will be used in converted Russian reactors, some of which are more than 20 years old. A Chernobyl-like accident involving plutonium would be far more serious than the original one, which involved uranium.

The plan begins with a total of 10 American and Russian reactors. But it would take these reactors 20 years to use all 1,000 metric tons of MOX the agreement would produce. If the agreement is extended to the rest of the American and Russian plutonium stockpile, this could exceed 60 years. This is why the agreement would bring other countries on board. Belgium, Canada, France, Germany, Japan, Ukraine and the United Kingdom have all expressed an interest.

By converting plutonium to MOX, the American-Russia agreement would help, an ailing American uranium nuclear industry. In order to transform waste plutonium into MOX, it must first be purified. This purified plutonium can be used for nuclear weapons. To counter this concern, the United States insists it will decommission all parts of its new plutonium industry once the weapons-grade plutonium is destroyed, thus ending the proliferation threat. But Russia has made it clear it intends to continue using plutonium for fuel. So have other countries. Japan plans to have one-third of its 53 reactors using MOX by 2010. There are already 30 reactors in Europe licensed to use the plutonium-based fuel. All are simply waiting for a steady supply. The Clinton-Putin deal will build the processing centers (several in Russia) necessary to ensure that supply.

On average, every reactor that runs on MOX fuel will require four to six metric tons of MOX which contains 250 to 300 kilograms of weapons-grade plutonium a year. According to the US Department of Energy this is enough raw plutonium to make about 55 small nuclear weapons. And with 77 metric tons of new civilian plutonium created every year, the chances of losing a few kilograms here and there are immense.

Half a Century of Dumping

Russia's "Plutonium Cities"

Russia has produced at least 200 tons of plutonium at three sites over the last half-century, with disastrous consequences for the population and the natural environment of the Urals and Siberian legions. Billions of curies of waste have been dumped into rivers and reservoirs, released into the air, and injected into the ground. The "Mayak" facility (also known by the Soviet code name for the nearby closed city that houses its workers and their families: Chelyabinsk-65, later renamed "Ozyorsk") is located in the Ural Mountains region near the industrial city of Chelyabinsk. It is the oldest and largest plutonium production centre in Russia. The surrounding territory has become contaminated with large quantities of caesium, strontium, and plutonium as a result of the plant's activities. Reprocessing activities at Mayak have created large volumes of liquid radioactive waste, a great deal of which has been dumped into local bodies of water. Mayak is located at the headwaters of the Techa river, which eventually flows into the Ob, a great Siberian river that in turn flows into the Arctic Ocean. From March 1949 to November 1951, 2.8 million curies of high-level reprocessing wastes were dumped into the Techa River, affecting 124,000 people living in 41 settlements along the river. Dumping of low- and medium-level wastes continued until the mid-1950s. Traces of radioactivity from the dumping were detected in the Arctic, more than a thousand kilometres away. Authorities prohibited use of river water after 1951, but because they failed to provide an explanation, local people continued to use the river for fishing, bathing, watering crops and animals.

Medium- and low-level wastes have also been dumped into natural and artificial reservoirs, which are vulnerable to floods and droughts. Among them is probably the most radioactive body of water on earth. Lake Karachay. 120 million curies of medium-level reprocessing wastes were dumped here, much of which has settled into the sediments at the bottom of the reservoir. Following partial drying of the lake caused by a drought in 1967, strong winds carried 600 curies of radioactive dust into neighbouring areas. Since the 1967 incident, work has been carried on to fill in Lake Karachay with dirt, rocks and hollow concrete blocks. However, this hasn't ended the threat of seepage from the reservoir. Additional reservoirs, some of which were created through the construction of dams along the Techa River from 1949 to 1964. contain additional hundreds of millions of curies of radioactive wastes. Filtration from the reservoirs has contaminated ground water to a depth of 100 meters over an area of 10 km^2, and continues to spread.

> *More radioactivity has been pumped underground in Russia than was released by Cbernobyl in the hope that it mould remain isolated for ever. If the hope provesoptimistic... Well,Russia is a vast country.*

Beginning in 1951, high-level liquid reprocessing wastes were stored in large stainless steel tanks. One of these exploded in 1957, in the famous Kyshtym accident, which was not officially admitted until 1989. An estimated 20 million curies of radioactivity were released in the explosion. More recently, some of these wastes have been vitrified (encased in glass) for long-term storage.

About 7500 residents were evacuated from villages along the Techa River between 1953 and 1960. Another 10,700 people were relocated after the 1957 accident, but many after a delay of one or two years. The village of Muslyumovo. located 78 kilometres downstream from the plant, has been one of the most heavily affected by the contamination of the Techa Readings taken there in 1992 showed levels of 300 to 500 microrads per hour, and readings even further downstream showed levels of 8.000 microrads per hour. The 3000 residents were never evacuated. A local community group has named itself "White Mice." reflecting a feeling that residents have been treated as material for radiation experiments Even after passage of a 1992 law to help those affected by nuclear contamination (known as the Chernobyl Law) Muslyumovo residents face an uphill battle Repeated promises for resettlement of those living closest to the river have failed to materialise. Furthermore, under the Chernobyl Law, radiation victims lose their right to health benefits and other compensation once they leave the contaminated area, and thus face a cruel trade off between their children's' health and economic survival. An important victory came in 1998, when, after several unsuccessful lawsuits, residents won the first-ever settlement against Mayak. on behalf of the family of a young boy with leukaemia.

Plutonium separation from spent fuel continues to the present at the RT-I plant Fuel imported from Ukrainian, Finnish, and Hungarian reactors has been reprocessed alongside Russian waste, and Minatom continues to seek foreign contracts for waste importation and reprocessing. At least 30 tons of separated plutonium is stored at Mayak. The plant also contains two small operating mixed-oxide (MOX) fuel production facilities. Under a recent US-Russian agreement (SEE P. 8], these facilities will be developed to fabricate MOX fuel out of surplus plutonium from dismantled nuclear weapons. Construction of three fast breeder reactors has been proposed at the neighbouring South Urals NPP, Work at the site began in 1984, and was stopped in 1987 due to lack of funds and public opposition. In spite of a referendum held in March 1991, in which 75% of voters opposed the plant, the Ministry of Atomic Energy (Minatom) has included construction of the plant in its "strategy for atomic development in Russia, 2000-2050," and is seeking funds in federal and local budgets [SEE P. 6 FOR MORE INFORMATION ON REACTOR CONSTRUCTION PLANS].

The Mining-Chemical Complex (also known as Krasnoyarsk-26 or Zheleznogorsk) is located inside of a mountain along the Yenisey River, one of the major rivers in Siberia that flows into the Arctic Ocean. More than 65,000 prisoners and 100,000 soldiers were involved in digging the enormous caverns which contain reactors and a reprocessing plant. One reactor is still operating, ostensibly to provide power and heat to Zheleznogorsk residents (although a large dam less than 100 km upstream on the Yenisey is only partially in use because of lack of demand). Two other reactors at the plant were shut down in 1992. These were "once-through" reactors, which drew their cooling water from the Yenisey and then dumped it back without any treatment, severely contaminating the river. Carried hundreds of kilometres by the current, radioactivity accumulated in sediments, fish and plants along the river.

The village of Atamanovo is located six kilometres downstream from the plant, and next door is a summer camp to which 5,000 children came every summer during Soviet times. Many local people have ignored prohibitions on swimming and fishing within five kilometres of the plant's discharge pipes.

Nearby and above-ground is the site of the proposed RT-2 plant, designed to reprocess fuel from VVER-1000 light water reactors. Construction on the plant has been sporadic since 1989 due to a lack of funds and ongoing widespread public opposition. A local campaign for a referendum on construction of the plant in the mid-1990s failed on a technicality: after more than the requisite 100,000 signatures to put a question on the ballot had been gathered, local authorities determined that construction of a federal facility could not be decided through a local referendum. Spent fuel from VVER-1000 reactors has been stored at the site since 1985.

Minatom has repeatedly sought foreign reprocessing contracts to help finance construction of RT-2. More recently, nuclear industry proponents have tried to alter Russia's Environmental Protection Law to allow long-term storage of foreign waste, as a means of raising funds [SEE P. 15 FOR ANOTHER WASTE IMPORT EFFORT]. (The law has been interpreted to allow spent fuel importation for reprocessing, because Minatom argues that it represents not a waste, but a valuable resource.) Recent proposals have suggested granite beds in the Krasnoyarsk region as a long-term storage site for this waste. Local environmentalists support construction of a geologic repository as an alternative to spent fuel reprocessing, but argue that storage should be limited to Russian and Ukrainian spent fuel which is already slated to come to the region.

The Siberian Chemical Complex (also Tomsk-7 or Seversk) is located less than 10 kilometres from the graceful old Siberian university town of Tomsk, on the Tom River, which flows into the Ob River. The site includes five reactors (two of which continue to operate, providing electricity and heat to both the closed city of Seversk and Tomsk proper), uranium enrichment and processing facilities, plutonium and tritium separation facilities, and plants for construction of nuclear warhead components. Planning for construction of high-temperature gas reactors at the site began in the mid-1990s, but remains in the research stage. Plans for a large-scale storage facility for plutonium and highly-enriched uranium, initiated in 1992, have been hampered by public opposition, arising from the fears about the danger posed by such a concentration of deadly materials and concerns that storage of these materials will lead to on-site processing, such as production of MOX fuel.

In April 1993, a tank containing plutonium, uranium, and other radioactive materials exploded, blowing a hole through the roof of the room where the tank was located, and causing a wall to collapse. Authorities waited a week before evacuating children from the village of Georgievka, the settlement most affected by the accident.

Liquid reprocessing wastes at Krasnoyarsk-26 and Tomsk-7 have been injected without any treatment into supposedly isolated wells formed by earth "collection layers" several hundred meters underground. 46 million cubic meters of waste with an activity of more than 2 billion curies have been injected at these sites, and at a third storage area near the plutonium research facility in Dimitrovgrad. In Tomsk, the injection layers are located just tens of meters above the area from which drinking water is drawn. Less is known about waste disposal practices at these sites prior to the advent of deep-well injection in the 1960s, but at least some portion of the wastes were dumped into above-ground reservoirs, as they were at Mayak.

The large-scale contamination of the environment resulting from careless waste dumping has been devastating to people living near the plutonium production plants. Health studies of Mayak workers and the surrounding population have been undertaken by the Institute of Biophysics (a division of Minatom). Existing evidence shows that cumulative exposure for Chelyabinsk-65 workers are much higher than for any other studied group of workers, and average individual doses for large groups of workers and some groups of residents exceed those recorded for either atomic bomb survivors (on average). But information on the resulting health impact is very unreliable because of a history of under-reporting of radiation-related disease, continued secrecy surrounding official medicafrecords, and deficiencies in existing health studies. Little information is available on the health situation of residents living near Krasnoyarsk-26 and Tomsk-7.

Contamination Threatens the Ob

Novosibirsk is one of the largest cities in Siberia and in Russia, with population exceeding one and a half million people. It is crossed by the Trans-Siberian railroad, which serves as the major communication line between central and estern parts of the country and Europe, and Far East. China and Mongolia. Novosibirsk is situated on the banks of Obseriver, which carries its waters all the way down to the Arctic

Novosibirsk is a host of several dozens of large industrial enterprises. In this article, we will deal with one of them Novosibirsk Chemical Concentrate plant - NCCP for short The plant is located on the northern fringe of the city, sonic 8 kilometres from the centre of the town NCCP was constructed 50 years ago for enrichment of uranium ores. Later, it was re-designed to produce nuclear fuel. In the Soviet Union, the plant used to be a monopoly, producing nuclear fuel for most commercial reactors *of* the country, as well as for many nuclear plants in the Eastern block countries. Presently, it keeps its leading position, shipping nuclear fuel to most Russian and some East-European reactors. Recently, the plant has signed a contract with China.

The character of the NCCP production is similar to that of the nuclear fuel plant in lokaimura village in Japan, the one which in October 1999 became the scene of that country's worst nuclear incident related to nuclear criticality. Two years ago, Novosibirsk Chemical Concentrate plant had similar incident. Fortunately, the release of radioactivity was much smaller.

For many years in Soviet Union, all works related to radioactive materials were classified as top-secret. For several decades, vast majority of the inhabitants of Novosibirsk had no idea that behind an ineffective sign "NCCP", right within city limits, was a huge nuclear enterprise.

Information began to emerge only with the beginning of Gorbachev's Perestroika, Improved availability of the information revealed another troubling problem. It soon become apparent that the data related to the environmental impact of the plant were virtually non-existent. Our non-government Institute "Siberian Scientists for Global Responsibility" has long been planing environmental inspection of the territory. adjacent to the facility. However, we were held back by the lack of suitable equipment We realised, that in order to work on the territory where one can encounter radioactivity, reliable dosimeters are vital, Luckily, in September 1999, two Americans from the "Government Accountability Project" visited Novosibirsk Louis Clark and lorn Carpenter had with them a dosimeter that allows measurement of alpha, beta and gamma radioactivity. Taking an advantage of this visit, we made a reconnaissance trip to the NCCP area When they returned from Novosibirsk, lorn and Luis left their dosimeter with us saying "you guys, need it more than we do" NCCP pumps its liquid waste through a four kilometre-long pulp feed-line into a tailing pond. There, the waste is discharged into a reservoir, supported by an earth-fill dam. About 20 kilometres downstream, the reservoir-hosting creek, Pashenka, flows in to the Ob' river

A fuel fabritation plant is situated within any limits causing radioditire containnation of the surrounding, with nosigns or warnings posted. Hyderabad and Norosibirsk, could beetwin cities.

According to official estimates, there are presently several metric tons of uranium accumulated in the bottom sediments of the tailing-pond. For may years, it used to be believed that loamy rocks that constitute the bottom of the pond and the bods of the dam absorb radioactive materials, purify the water, and do not permit the migration of radionuclides downstream

So. we readied our dosimeters and set off to carry out an independent examination of the tailing dump ground. The pulp leed-line pumps tens to hundreds of cubro meters of radioactive sludge per day. The pipe is not marked. There is no fence around it and neither is it guarded. There are no radiation signs posted anywhere in the vicinity We made a brief stop near the pipe, and immediately found heavels contaminated soil underneath

For about *one* kilometre. the pulp feed-line goes within few meters from a major highway connecting Novosibirsk with Tomsk and this is just a few hundred meters from the Trans-Siberian railway tracks Even inside the car, our dosimeters recorded radiation twice the background Only near the police station the pipe is shielded by thin metal sheets

Our initial plan was to examine part of the pond adjacent to the dam. and to collect samples of the bottom sediments and water from observation wells drilled in the dam However, our very first readings forced us to change our plans

A concrete structure, which we spotted, turned out to be an open flood spillway During spring snowmelt, when the water level in the pond rises by more than one meter, the water discharges through a system of pipes directly to the creek valley downstream of the dam Near the spillway notch, we *found* heavily contaminated soil - up to 1000 mcR/h or about 100 times the background. This meant that in spring time. radioactive water from the pond could discharge in the Pashenka creek valley So.

we decided to check radiation levels at the other end of the spillway.

In the service pit, our dosimeter showed elevated levels radioactivity. Also elevated were readings near the spillway pipe outlet on the flood-plain. A yet more shocking discovery lay ahead of us. We found that the spillway pipe, through which even in the most dry season of the year their was a flow of about I litre of water permimum was not the sole water flow path through the dam. In several places, we found small springs seeping from underneath the dam. Such seepage, is an indication of degrading dam stability. The water in the dam serves as a lubricant, so in spring, or after heavy rains, the dam may not endure water head and may one day lose its integrity. Having found an uncontrolled seepage of water from the pond that stores several tons of uranium, we decided to check contamination of the Pashenka creek flood-plane downstream from the dam. Another discovery awaited us there. On the reedy flood-plane, our dosimeters showed 3000 mcR/h - 300 times the background.

During the following days we surveyed this swampy and reedy valley. Having collected more than a thousand measurements, we determined that the radioactive contamination extends along the valley for almost four kilometres. The inescapable conclusion is that large amounts of radionuclides have accumulated outside the tailing pond of the Novosibirsk Chemical Concentrate Plant, and reside on the Pashenka creek flood-plane as a man-made radioactive body. This body 'lives" in accord with its own natural laws, and is not confined by any engineering barriers. Radionuclides that contaminated the flood-plane will remain radioactive for hundreds million years. Contamination zone is slowly moving downstream. We estimate that it may reach the main channel of Ob river within several decades.

Based on the film script of "Leaky Dam Where does radiation go? " Produced by Siberian Scientists for Global Responsibility

The Nuclear Mindset

A sophisticated approach to environmental concerns from Russia's top nuclear official

"in *Russia, ...Me ask ourselves, Is It possible for the world to have large scale nuclear energy? By large scale, l do not mean the same as we have now, with around 5 percent to 7 percent of the total energy balance. This is a very small contribution to resolving the energy problem, large scale is, for eiample, 30 percent,* 40 *percent or 50 percent.* At *this scale we could really resolve not only the energy demand problem, but also environmental problems." "The question Is, if we have such a level of nuclear energy, is il possible to manage the waste, particularly the spent fuel? Can we keep the same level of radioactivity as we had before we developed nuclear at all? The answer is yes, if we have the closed fuel cycle, we have the possibility to keep the same level of radioactivity. This means achieving a balance between the radioactivity of the waste being buried and of the uranium extracted from the earth."*

—Evgeny Adamov, Russian Minister of Atomic Energy from a September 1999 speech to the Uranium Institute, London

MAYING WITH NUCLEAR FIRE

LESSONS FROM THE 'KURSK' CATASTROPHE

In March 1994, Aleksandr Nikitin, then a 44 year-old former submarine captain, published a report on the appalling state of safety in Russia's Northern Fleet, which handles the bulk of the country's nuclear-owered submarines. Using publicly available information, he painstakingly documented the Fleet's declining operation and maintenance standards, accumulating and overflowing radioactive waste, steeply falling budgets and morale, and the growing scarcity of spares, and warned of a series of disasters. Nikitin was arrested in February 1995 and charged with espionage and treason, punishable with death. Detained for months without trial, Nikitin was not allowed to choose his own lawyer. Finally, last year, he was acquitted by the courts, but now faces another trial on the same charge.

Welcome to the Kafkaesque world of nuclear weapons and submarines! The Kursk tragedy hasn't ended. The submarine's two nuclear reactors, with a 380 MW output, still lie 108 metres deep inside a damage hull amidst torpedoes, high explosives and other hazardous material. They contain an estimated 1,200 kg of highly enriched uranium, mostly U-235, with a half-life of a mind-boggling 710 million years. Therefore, huge quantities of the radioisotope will continue to menace the marine environment and humans for millions of generations to come. Even assuming that the reactors were not damaged by the explosives that sank the sub, which seems unlikely, dismantling the potent cocktail of uranium, hundreds of fission products including deadly plutonium, and chemical explosives, will entail large radioactivity exposures. The job will be incomparably more onerous than accessing the sub's rear hatch—a week-long, super-expensive, multi-national effort. Abandoning the sub would mean leaching radioactivity into the environment.

The Kursk is only one disaster that Nikitin forecast. "Much bigger ones are waiting to happen around Murmansk and Severomorsk", he told me two months ago in Stockholm. This severely depressed area of the Kola Peninsula holds 21,000 nuclear fuel assemblies and one-fifth of the world's 1,200 nuclear reactors—in patently unsafe, rapidly deteriorating, conditions. More than 200 reactors are literally rotting aboard 110 submarines which have been taken out of service. (About 180 Russian subs have been decommissioned). The Fleet, which receives less than half its designated minimum budget, has no money to dismantle the nuclear cores. Indeed, "it often lacks money to buy rations for the crew", says Nikitin, whose case this writer has followed since 1995. The result: scores of subs are corroding and sinking as their reactor compartments fill with water—presaging an ecological catastrophe. As bankrupt Russia's military budgets shrink—now to less than half the level of India's—training, maintenance and safety norms plummet further, making disaster likelier in the world's largest nuclear arsenal.

Russia's specific troubles are only *one* part of the nuclear submarine story. The other two parts are generic. Nuclear submarines everywhere are extraordinarily disaster-prone. And nuclear establishments everywhere operate secretively, irrationally and in paranoid ways. Nuclear subs have had serious accidents ever since they drove the Cold War's most furious phase of arms racing, in which safety hardly mattered. Today, wreckages of American and British as well as Russian subs lie on the earth's ocean floor. There have been numerous accidents aboard US, France, British and Russian submarines. "Greenpeace" has documented 121 "incidents" in the last case, 10 of which caused reactor damage. There were also two core meltdowns — a nuclear reactor's maximum accident —in 1979 and 1989. Nuclear subs have inherent safety problems because they (like bombs) pack huge amounts of energy in small volumes and operate in conditions much harsher than civilian power reactors, themselves seriously accident-prone. A small error gets magnified into a big crisis.

The authorities' handling of the Kursk crisis further compounded the catastrophe They first denied, and then tried to deflect attention from, its gravity. For four critical days, they refused offers of foreign assistance out of hubris and "national pride". President Putin refused to cut short his holiday. The British and Norwegians too delayed sending in assistance. Russia's nucleocracy refused to disclose relevant information, including the sailors' names, the sub's location, and the accidents circumstances. According to independent sources, there were two internal explosions, not a major collision, as claimed. Journalists had to bribe naval officers to get the victims' list. Their number too was raised without explanation from 116 to 118. When relations confronted them, the bosses used KGB/CIA-style methods: forcibly injecting sedatives to silence questioners

Such sordid behaviour is typical of all nuclear establishments Whether in the US or USSR, France or Iraq, China or Pakistan, these all-male "Dr Strange love outfits" *are* marked by excessive secrecy and dominated by unaccountable "experts" who cynically exploit their privileged access to information. Secrecy cuts across the democracy-dictatorship barrier. For 40 years, the US refused to divulge facts about its terrifying radiation experiments on humans, including injections of poisons. The N-5 have always suppressed or denied unpleasant facts about their nuclear programmes. Transparency and nuclear activities just don't jell. Nuclearism, with its bellicose "national security" mindset, its crude male-supremacism, its coarse social-Darwinism, its abiding faith in violence and mass destruction, has little use for effete, "effeminate" or "idealistic" things like human rights, social/gender justice or decency. Nuclear weapons and democratic accountability are mutually antagonistic.

All this applies a fortiori to India. The Atomic Energy Act (1962) betrays utter contempt for accountability. It allows arbitrary suppression of all information —patently unconstitutional, according to V.K. Krishna Iyer. The atomic energy department (DAE) is easily one of our most secretive. It has much to hide: uranium mining hazards in Jadugoda, excessive irradiation of power-plant workers, waste mismanagement, numbers regarding explosive yields...Worse, we have our own Nikitin: former Captain B.K. Subba Rao who too was charged in 1988 with spying and jailed for 20 months—until fully exonerated by three courts. His real crime? Questioning the DAE's nuclear sub (Advanced Technology Vessel) project, a spectacular Rs. 2,000 crore failure. Evidence of "espionage"? His IIT-Bombay Ph.D thesis.

However, we have an additional, special problem: unacceptably poor, sub-Russian safety and reliability in India's nuclear and defence establishments—witness 202 Air Force plane crashes in nine years, the Main Battle Tank project mess, the Purulia arms drop, the distinction of having six of the world's 10 dirtiest nuclear reactors; or for that matter, industrial and road accident rates four to 12 times the OECD average. It won't do to deny, Russian-style, India's poor safety culture and disaster-proneness. We can't even run power-grids and surface transport safely. It would be disastrous to let hubris drive us towards nuclear catastrophe. We must freeze our nuclear and missile programmes and return to the global disarmament agenda.

Praful Bidwai
Times of India 30.8. '00

The Nuclear Mindset (Indian Version)

The Nuclear Power Corporation of India Ltd. (NPCIL)has drawn up Rs. 100cr. estimates for establishing infrastructural facilities at Kudankulam where the Department of Atomic Energy has proposed to establish water cooled and water resistant (VVER) nuclear reactors with Russian assistance.

Mr. V. K. Chaturvedi, chairman and managing director of NPCIL told reporters at the site near here on Sunday that the estimates had been submitted to the Atomic Enem Commission for approval and funds would be released soon. Maintaining that funds could never be a constraint in establishing the atomic power plant, the CMD said the construction work would commence from January, 2001 following the receipt of the Detailed Project Report (DPR) being prepared by the Russian agency, Atomen Ergo Export (AEE), in December this year.

The DPR would be implemented after scrutiny by the Atomic Energy Regulatory Board. The actual construction of the reactors would begin from 2002 onwards, he said, adding that the first reactor would be commissioned by 2007 and the second in 2008.

The Kudankulam project had been included in the Vision 2020 and it would help in generating extra power. The site acquired by the Corporation was sufficient for establishing six nuclear reactors and it had been planned to set up four reactors of 1000 mw capacity each. The reactors would be commissioned in a phased manner to ensure that the power generation capacity doubled once in seven years. About 50 Russian scientists initially and totally 700 in addition to 1,500 Indian scientists would be involved in constructing the reactors.

Asked if a jetty would be constructed at Kudankulam for importing the required material from Russia, Mr. Chaturvedi said the proposal had been shelved and instead they were concentrating on developing the port at Tuticorin. To another query on the dependence of potable water for cooling the reactors, Mr. Chaturvedi said though about 3.5 casees of water was likely to be drawn from the Pechiparai reservoir, the authorities would make alternative arrangements such as sinking bore wells and installing desalination plants.

The Hindu August 29, 2000

Vast Quantities of Potable Drinking Water for the Nuclear Monster

Promises of Desalination for the Public

Dump, Dump,... Russia is a Vast Land

Russian Weapons Lab Signs Secret Deal to Import Nuclear Waste

According to confidential documents, obtained by ECODEFENSE!, Russian officials are planning to approve a dump site for Taiwanese and Japanese nuclear jauste on Simushir Island (one of the chalin Islands, located in the Russian Far East). The project is being organized by the Kurchatov Institute (Kl), Russia's largest nuclear weapons laboratory, and Asia Tat Trading Co Ltd, which manages radioactive waste in Taiwan and Japan. Profits are estimated by the organizers at US$ 10 billion.

Taiwan Power Company (Taipower) has confirmed that it had signed an agreement with a Russian weapons center to store its nuclear waste, but denies a Japanese firm is involved in the deal. Instead, Taipower insisted no third party was involved, but confirmed a morandum had been signed with a Russian organization to transfer waste to country.

"It's just a preliminary plan involving 5,000 barrels of nuclear waste,'* said Huang Huei-yu, division head of Taipower's public affairs department. "The idea of shipping waste to Russia has been held up by its laws that ban the import of any nuclear waste," said Huang.

But according to Taipower documents — written in Chinese and publicized by ECODEFENSE! on the Internet — the project includes technology provided by ATT. The documents, dated May 19, 1998, show that 200,000 barrels of Taipower's nuclear waste will be shipped to Russia via Japan within 10 years. Taipower will pay NTSS00 million, or an average of NT$4.000 per barrel.

Benefits to the three parties were also mentioned in these document!. For Taiwan, problems caused by the lack of dump sites for nuclear waste would be solved, while thousands of job opportunities would be created for Russians. As for Japan, documents show that as the agent, ATT would make a handsome profit.

According to the documents, KI has promised to lobby for changes in Russian legislation in exchange for financial support of Asia Tat Trading Co Ltd. Article 50 of the Russian Law on Environmental Protection Law bans the import of nuclear waste to Russia for storage or dumping.

Poison your land to have the money so that leaders can strull about being a global power! It takes all kinds.

The documents also show that KI is seeking federal funding for the Sakhalin project. in order to avoid problems with Russian legislation, Kl has presented the proposed dump site as urgently needed to manage a large amount of KPs own waste, without mentioning Taiwanese and Japanese wastes. But a memorandum signed by Kl and Asia Tat Trading Co Ltd clearly shows the intent to dump both Russian and Asian (Taiwanese and Japanese) radioactive waste. Construction of the site would cost US$ 2,5 billion. The president has on his desk a decree "On additional efforts for cleaning up radioactive contamination in Russia and improving the security and effectiveness of radioactive waste management** that would clear the way for the Sakhalin dump.

According to the documents, Vice-chairman of the Duma (louver house of Russian parliament) Committee on Environmental Protection Sergey Shahurin asked leaders of the parliamentary fractions to sign letters of support for the presidential decree All fractions of the Duma have lent their support. Mr. Shashurin also requested official permission from Kl to negotiate the Taiwanese waste imports. Official negotiations with Taiwan would violate a 1992 presidential decree that ended diplomatic relations between the countries.

Taipower's Huang said it was too early to say whether the memorandum would become a workable contract.

"Since the uncertainty regarding transporting nuclear waste to other countries continues to exist, Taipower has not given up building a final storage site for its nuclear waste," said Huang, adding that an environmental impact assessment for a disposal site at Wuchiu island, near Kinmen, was scheduled to be filed by the end of this year.

It has been reported that Taipower plans to begin operating the nuclear waste dump in 2012, but that these plans could be affected by local protesters asking for compensation.

Taipower said it was working with other countries, including North Korea and China, to find sites for final disposal.

Revelations of a similar secret agreement with Swiss and German companies, uncovered by Greenpeace International in 1998, caused widespread outrage in Russia.

Sources: ECODEFENSE! and News Agency Staff Reporter Chiu Yu-Tzu, July 6 2000

The Editor's Last Word

Now a days many people ask me quite often, "What's happened to Anumukti. I haven't seen it for a long time." I have run out of excuses. The hard unpalatable truth is that my interest has waned. Most of the people who receive Anumukti never even open the wrapper. (Figuratively speaking since actually Anumukti does not come wrapped.) Of those that do, once in a while glance through it, many can and probably do get most of the information through the electronic media. So what is the point of working hard at getting out a journal which does not cause even a ripple.

But then there are some die-hards who insist that Anumukti must go on. Most of these don't do any thing besides exhortation, nothing practically useful for achieving this goal. But again there are some who are willing to put in the effort to flog and revive dead horses. As they say it takes all kinds. Ms Anita Seth is one of this rare breed, it is entirely due to her efforts that this issue of Anumukti is in your hands. We, the rest of the Anumukti team are thankful to her for the kiss of life.

This issue concentrates on Russia. Russia is a wonderful country. The people are warm, full of life and laughter and able to shrug off difficult times. Very much like Indians. And like us they too have been burdened for long with a political leadership with no vision and no empathy.

But there is one big difference between Russia and India. Russia has a population less than one sixth that of India occupying an area more than six times as large. Except for sunshine it has lot more resources of almost everything and yet it has a declining population with a declining life expectancy. The reasons for this apparent paradox are not very obscure. In the race to be a superpower, the Russian leadership polluted vast regions of this vast land with poisons. Not only radioactivity but chemicals as well. The misery of the people today is a direct result of this short sighted misadventure.

The Indian leadership today too is engaged in a similar quest for 'glory'; for becoming a global power. Like all the rest of this breed they too believe that this power shall come out of a barrel of a gun or rather through the possession of devices of mass destruction. They too are willing to make any sacrifice or rather they are willing to sacrifice the people in the name, of security. Thousands of nuclear weapons, submarines, a vast military infrastructure did not secure Soviet Union. It will not secure India. Security comes from the well being of all the people.

Decline does not always teach wisdom. It certainly hasn't to the Russian leadership. Their solution to the difficult situation facing them is to pollute even larger areas of the country. They want to make Russia the nuclear dustbin of the world. Earn money doing this and build even more nuclear power plants so that the present energy wasteful lifestyle can continue. A Kursk or a Chernobyl once in a while can be shrugged off as an aberration caused by the inevitable human error. The pity is that the elite in India without the vast land resources is also engaged in the same suicidal course importing the very same technology in Koodankulam. Koodamkursk is waiting in the wings.

Surendra Gadekar

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Anumukti team: Anita, Hansa, Daksha Philips, Shreekumar, Ishwar, Sanghamitra and Surendra

Published by
S.Gadekar for Sampoorna Kranti Vidyalaya
Publication Date: September 6, 2000
Printed at:
Ashish Offset, Sankeshwar Complex, Surat

Printed Books
(Clause 121/1 of P&T Guide

Christian Workers Fellowship
P.O.Box 381 39 Bristol St.
Colombo 1,
SRI LANKA